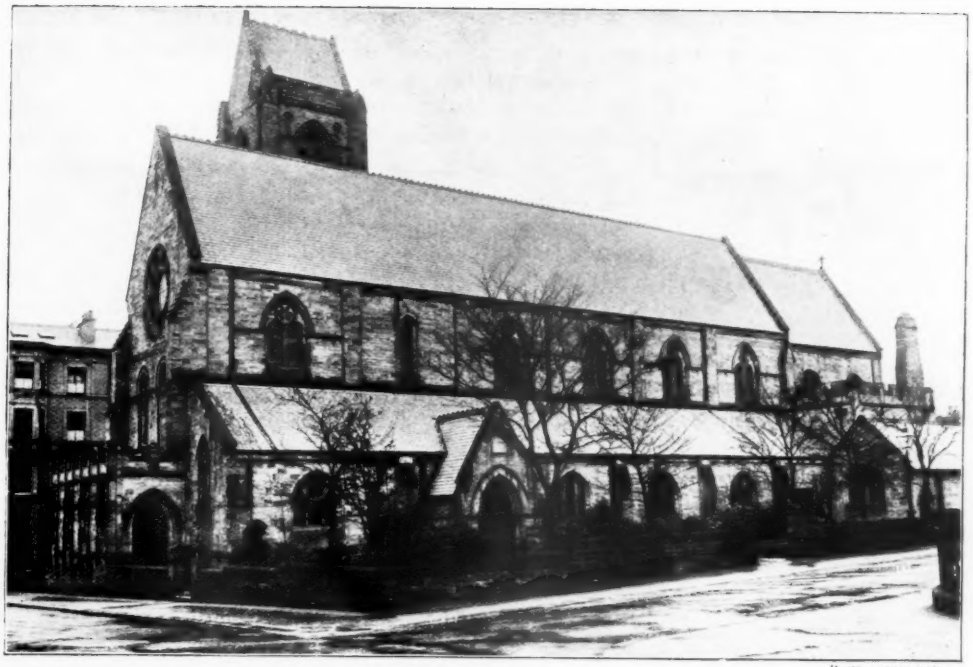


FIG. 1.—CHURCH OF ST. MARTIN-ON-THE-HILL, SCARBOROUGH. *Photo. Valentine & Co.*

GEORGE FREDERICK BODLEY, R.A., F.S.A., D.C.L.

Born at Hull, 14th March 1827. Died at Water Eaton, 21st October 1907.

"TO do one great work and to die looking through a lattice window." Such was the ambition he expressed, when a young man, to a friend who reminded him of it only shortly before his death. Not one, but two great works came to him at the end, the Cathedrals of Washington and San Francisco—in Liverpool Cathedral his share was a subordinate one; and he died in the stone-mullioned Manor House of Water Eaton, near Oxford, in which he had lived for little more than a year.

His father was a physician, first at Hull and afterwards at Brighton. It was at Brighton that he first met George Gilbert Scott on the occasion of the marriage of Scott's brother to his sister. How he came to take up architecture can be best described in his own words: "Just previously I had been reading a book on architecture, Bloxam's *Gothic Architecture*, and had become bitten with a curiosity about the history and the art. My father arranged, at my wish, that I should be with Gilbert Scott, and soon after the marriage mentioned I went and lived with Mr. and Mrs. Scott in Avenue Road, Regent's Park. I had not drawn at all before. The only sketch I remember making was one of the sea at Brighton when the moon made a broad path of light that led to mystery and darkness. I remember showing it to Scott, who said it was not architecture—which it certainly was not." He remained in Scott's office for five years, and on leaving at once commenced practice. His first work was adding an aisle to a church at Bussage in Gloucestershire for Thomas Keble, the brother of John, and in a statement he made in 1901 he said, "What works I carried out for some time I could

trace to this added aisle at Bussage." Other churches soon followed: St. Michael and All Angels, Brighton; Stanley End, Gloucestershire; France Lynch; St. Martin-on-the-Hill, Scarborough, consecrated 1863; All Saints, Scarborough; All Saints, Cambridge, a church with a central arcade; St. Michael, Folkestone, enlarged later; and St. John, Tue Brook, Liverpool, all built before 1870, the last three showing no trace of the French feeling so conspicuous in his earliest work. In 1869 or 1870 he took into partnership Thomas Garner, who had also been a pupil of Scott, although after Bodley's time. For nearly thirty years the firm was known as Bodley & Garner. For the first half of that time they worked together in such perfect harmony that it is quite impossible to say to whom the credit for any design, or even any portion of a design, is due. During the last ten or fifteen years of the partnership, which was dissolved in 1898, they divided the work: one carrying out entirely one building, the other another. In the days of their active collaboration they always worked at their homes, never at their office in South Square, Gray's Inn; in fact there was no place there where they could work. This accounts partly for the difficulty of stating with certainty which was mainly responsible for any one building. Afterwards they moved to Gray's Inn Square, where there was more room, and then they visited their office more frequently. For about ten years they lived four doors from each other in Church Row, Hampstead, and all full-size details were made there by one or the other. Small-scale drawings were made in the office, but that was about all. They sometimes even set out their traceried windows full size themselves. So much did they alter designs after they were first made that I remember, in the case of the Master's Lodge, University College, Oxford, built about 1878, I hardly recognised the building when I saw it, although I had worked on the ½-inch-scale drawings.*

In consequence of the reasons given above it is impossible to separate Bodley's share from Garner's during several years, and neither probably would have wished that any attempt to do so should be made. But when dealing with the early work done before the partnership began, and with the later work of the last fifteen years or so, there is no such difficulty, and Bodley's rare taste is manifest at both periods. His early churches—St. Michael's, Brighton, St. Martin's, Scarborough, &c.—were designed when he was strongly under the influence of early French Gothic, but he treated his plate-tracery windows and other borrowed features he introduced with marvellous refinement and with an originality which carried them far outside the range of mere copying. In after years he was out of sympathy with, and spoke disparagingly of this earlier work, but it is a question whether the two churches mentioned do not rank among his best. In a letter he wrote me in 1896 he says: "St. Michael's, Brighton, was a boyish antagonistic effort. Not believing in what one saw at Scott's one went in for a violent reaction. One had seen bad mouldings, and so would not have any, and inane crockets – one felt 'away with them'—which was but the weakness of youth." I cannot help feeling—and I am sure others will agree with me who knew St. Michael's before it was enlarged by another architect—that "weakness" is not the right word. The church was built nearly fifty years ago; and if ever an early work showed genius that work is St. Michael's.†

St. John's, Tue Brook, finished in 1870, was nearly, if not quite, the last church designed by Mr. Bodley before the partnership began. St. Augustine's, Pendlebury, near Manchester, followed soon after. It was consecrated in 1874. In plan it is based on the great brick churches at Albi and Toulouse, and consists of a wide nave with internal buttresses which are pierced so as to provide an ambulatory aisle on either side. It was, I believe, the first

* This work was not done by contract; there was no builder; the clerk of the works ordered the material and paid the workmen.

† The photograph, kindly lent by Canon Sanderson, the Vicar, shows the church before it was enlarged. The reredos is generally hidden by a fine fifteenth-century German triptych, which still stands behind the altar.

church built in England in which this type of plan was adopted, and it is remarkable also for another reason. The window tracery throughout is a mixture of Flowing and Perpendicular

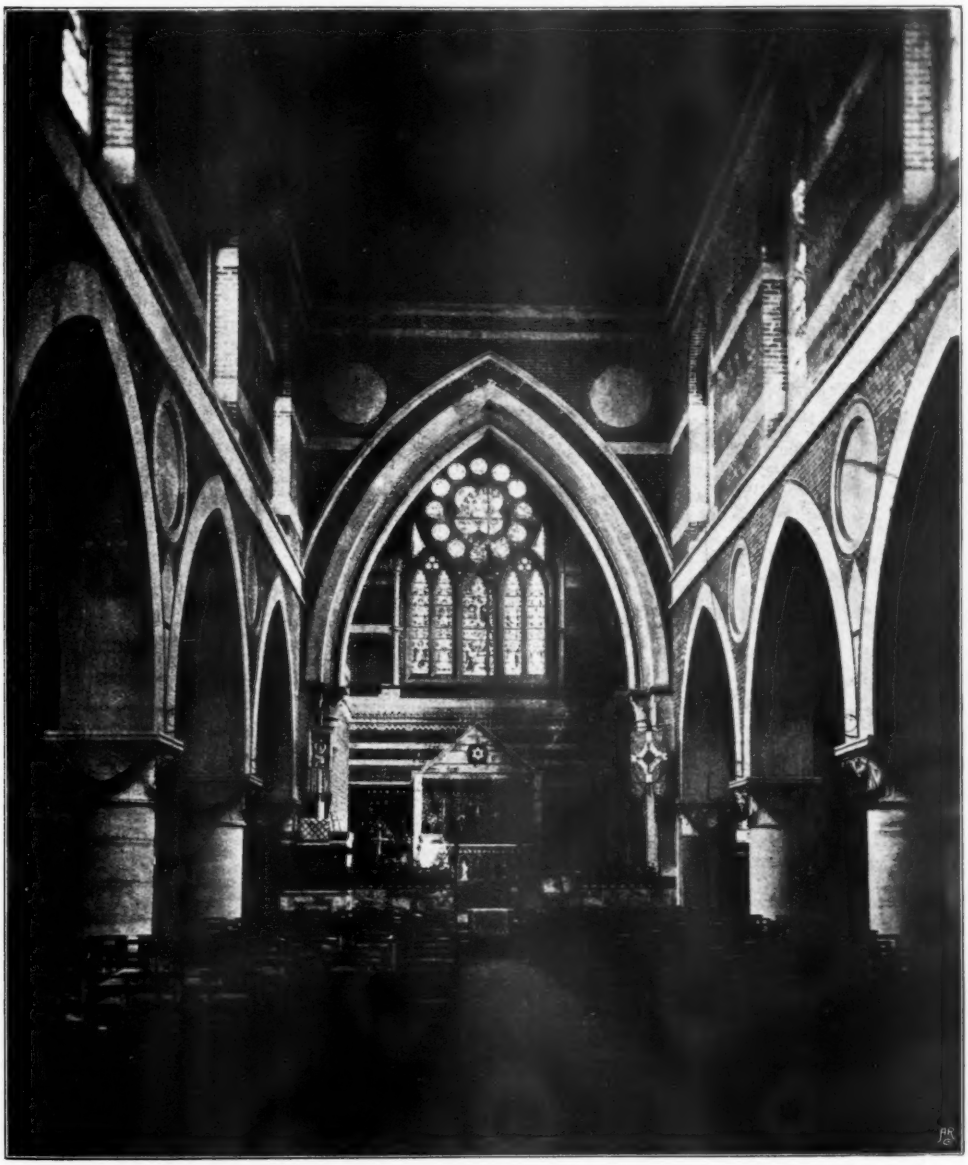


FIG. 2.—CHURCH OF ST. MICHAEL AND ALL ANGELS, BRIGHTON.

lines, and is similar to that which is to be found in a few churches built about the time that the Black Death of 1349 wrought such havoc amongst the craftsmen of the time. There is

a more marked break then in English architecture than at any other period. Bodley's aim was to continue the development which was just commencing when it was nipped by the Great Plague. In the Church of Hoar Cross, Staffordshire, built about the same time for the Hon. Mrs. Meynell Ingram—the most elaborate and most stately of small churches in England—the same desire is manifest.* Whether these two churches set the fashion, or whether the movement was in the air, is difficult to say without knowing the exact dates of approximately contemporary churches; but it appears certain that before Pendlebury was built this feeling had not appeared in English churchwork since the Gothic revival com-

Photo. Sarony & Co.

FIG. 3.—CHURCH OF ST. MARTIN-ON-THE-HILL, SCARBOROUGH.

menced. It is noticeable in the work of Bentley, Sedding, G. G. Scott, jun., &c., especially in the charming St. Agnes, Kennington, of the last named, built about 1877.

In St. Michael's, Camden Town, built in 1879, and in many subsequent churches, Mr. Bodley turned to a somewhat earlier phase of English Gothic for inspiration, and displayed a less exuberant fancy. Not so original as the early churches, these later ones show his absolute mastery of detail, his rare refinement and unerring taste, coupled with fine proportion and great dignity. He played no pranks with Gothic architecture. His love for it was too deep. Replying to a letter congratulating him on receiving the Gold Medal of the Institute,

* One of his last works was to add a narthex to Hoar Cross Church, in which is to be placed a monument to its two architects.

he writes: "It was as unexpected as unsought. I suppose it is one of the accretions of advanced life. But I feel it to be an honour done to my beloved old Gothic rather than to what little I may have done." His principal later churches for which he was solely responsible are:—Clumber; Cowley St. John's, Oxford; Hackney Wick; Eccleston; Chapel Allerton and Holbeck, near Leeds; Warrington; St. Aidan's, Bristol; St. Faith's, Brentford; Horninglow, near Burton-on-Trent; Holy Trinity, Prince Consort Road, Kensington, &c. His own favourites were Clumber Church, for the Duke of Newcastle; and Eccleston Church, for the

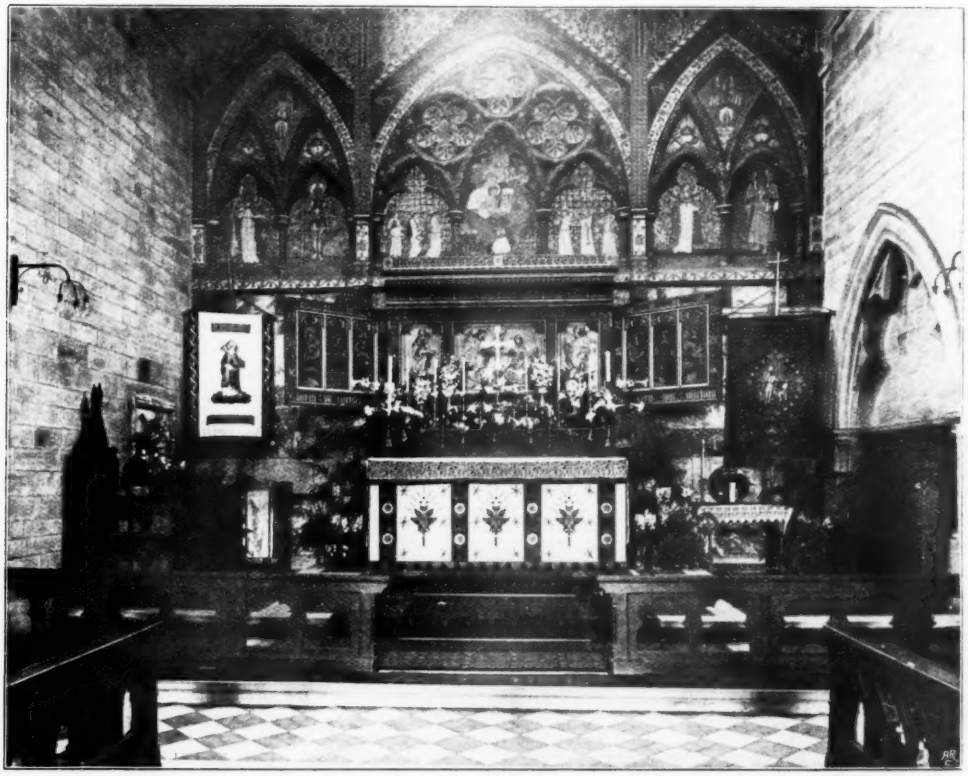


Photo. Sarony & Co.

FIG. 4.—CHURCH OF ST. MARTIN-ON-THE-HILL, SCARBOROUGH: REREDOS.

Duke of Westminster. He had the great gift of being equally at home with both town and country churches. All Saints', Danehill, Sussex, is an ideal country church; the Eton Mission Church, Hackney Wick, is as unmistakably a town one. He could spend thousands well, as Hoar Cross Church shows, and yet obtain distinction with hundreds, as at Hackney, and Cowley, Oxford.

His greatest disappointment was losing Truro Cathedral in 1878. Here was a chance of his "one great work." The competition was a limited one, and he made certain of winning it. Pearson contented himself with sending drawings of executed work. Bodley, on the other hand, besides forwarding photographs and perspectives of Pendlebury, Hoar Cross, &c., prepared a complete design. He did more; he sent alternative designs on fly-leaves, which in the opinion of the "office" would have been better omitted, as likely to confuse the

Committee. The design he preferred himself showed a pair of towers over the transepts, as at Exeter. He proposed to retain two bays of the old fifteenth-century church as a Lady chapel at the east end.* Two years previously he had competed for and lost the "Schools" at Oxford, won by Mr. T. G. Jackson, but in his next Oxford venture he was more fortunate. In his design for the new Quadrangle for Magdalen College he challenged the fifteenth century on its own ground, played it in its own game—and beat it. His design for the new tower leading from the old Quad to the new is in many respects finer than anything Oxford can

Photo. Cyril Ellis.

FIG. 5.—CHURCH OF ST. AUGUSTINE, PENDLEBURY.

boast of the fifteenth century. In the first competition for Liverpool Cathedral he took little interest. He felt that it would never be built on the site then selected. Besides work, mainly domestic, was beginning to pour in upon him and he had little time for competitions.

He is so often referred to as a "church" architect that many have little idea of the

* St. Mary's, Truro, was a double-nave church with a central arcade and without aisles. Pearson eventually kept the whole of the southern half, which gives scale to the bigger, simpler work behind it.

number of houses he built, added to, or altered, and of how long ago it is since he began this work. Some of his houses were among the first red brick ones built in England in eighteenth-century fashion, after the advent of King Stucco. The vicarage of St. Martin's, Scarborough, is a most delightful simple house, and absolutely modern, although built early in the sixties. Another early house of his is the vicarage at Pendlebury. Contemporary are

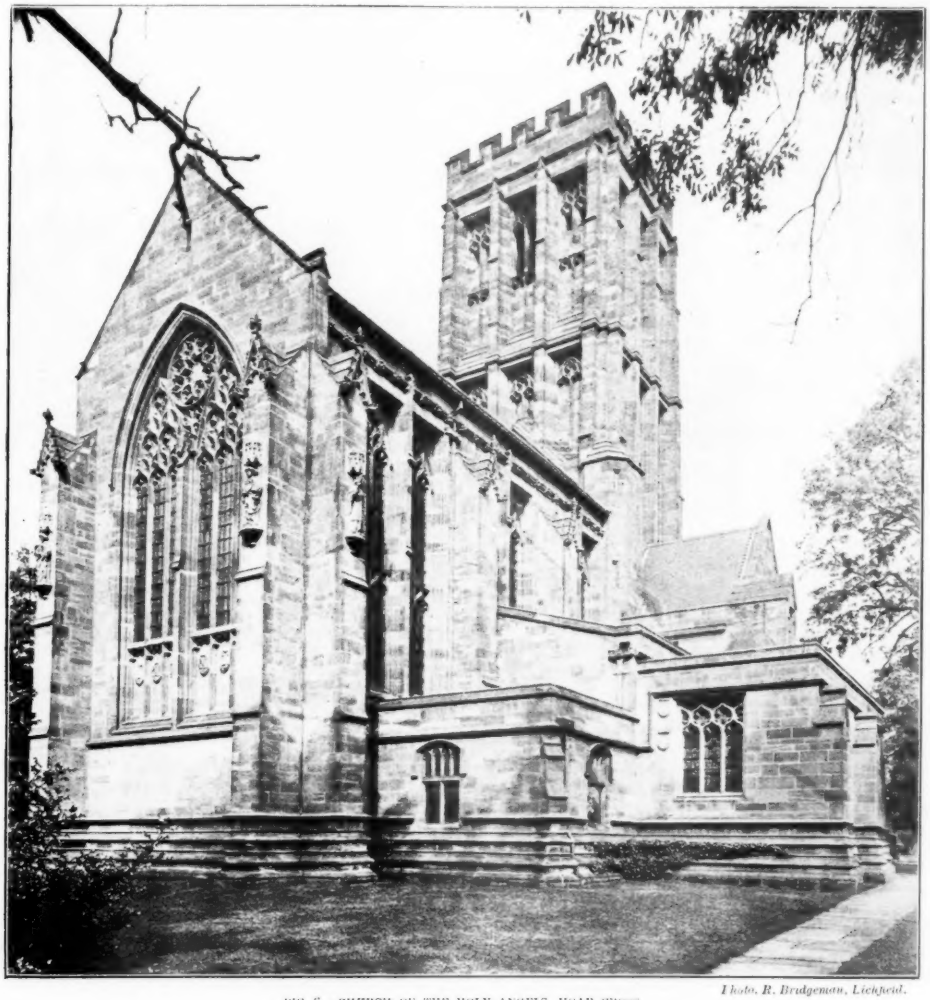


FIG. 6.—CHURCH OF THE HOLY ANGELS, HOAR CROSS. *Photo. R. Bridgeman, Lichfield.*

five houses forming a group at Malvern: two houses are detached, whilst three are grouped together in one in a very charming fashion. These were finished in 1869. In 1896 I had a reason for asking him for the dates of these and of other early ones. He replied from his house at Iver, Bucks, where he generally lived and worked before he went to Water Eaton. His answer is characteristic of the man and is worth quoting: "I am not at all well up in the dates of any of the buildings you name. Pendlebury Parsonage was built before Garner's

time, but I really don't know the year. It was some time before the church was thought of. However, I do not think it is worth while to mention these things. It would suffice to say I was early in the field. 'Our little systems have their day.' But our little systems are not worth much, and certainly do not last long, though art is long and buildings are stubborn facts. . . . . I am getting a new life working here in peace and quietness, and no cribs with me. But at my time of life one ought to know all the cribs by heart. . . . I am sixty-eight and a bit now, more's the pity. Just as one gets to know something, however little, one has to go to sleep." *

As a young man he built some schools, and in 1872 he won in competition the London School Board Office on the Embankment, since more than doubled in size. Garner was his partner at the time, but the design was submitted under his name alone. In 1876 the firm built the house at the corner of Tite Street, Chelsea, for the Hon. J. C. Dundas. Its design is based on Kew Palace, the front of which they had measured purposely, and the curious can trace the resemblance between the two buildings, although one is very far from being a copy of the other.

The names of the houses, churches, college halls, &c., that he decorated would fill a page or more of this Journal. In decoration he revelled. His sense of colour was exquisite. Without the slightest exaggeration he may be said to have been the one architect of the last century who knew how to paint a church, and who took good care that it was painted. † In St. Augustine's, Pendlebury, walls, roof, screens, organ-loft, and reredos are all painted, and all windows are filled with stained glass. To assist him in his church and house decorations he, together with his partner and G. G. Scott, jun., started Watts & Co., in Baker Street. In the seventies Morris's and Watts's, very different in their ideals, were almost the only places in London where really fine hangings, wall-papers, &c., could be bought. He was originally called in to advise as to the decoration of St. Paul's Cathedral, and prepared a scheme which was not carried out. His desire was to treat Wren's work with the utmost reverence. He found in the choir proof that the stonework had been either painted or distempered before, and his proposal was to use white paint and gilding only, with pictures in the compartments of the vault framed in by the moulded ribs.

In late years he was somewhat criticised for not placing work in the hands of recognised artists instead of firms. He was accused of not being in sympathy with the movement for the union of the arts. How he must have smiled if these accusations ever reached him, which they probably never did, as he mixed little with the younger generation of artists. The truth is he was the pioneer of the movement before the movement itself can be said to have commenced. A reference to his early work proves this. He obtained for Burne-Jones his first commission—or at all events one of his first. This was to paint a triptych for Wagner's Church of St. Paul, Brighton. The work Bodley was doing was not finished when the picture was ready, and Burne-Jones asked permission to sell it to some one who had come into his studio and admired it, and to paint the replica, slightly altered, which is now in the church. How the original, lost for years, came finally into Mr. Bodley's own possession is too well known a story to need repeating. In the west windows of St. Michael's, Brighton, and in the Stanley End Church can be seen some of the earliest of Morris's glass in the kingdom, the cartoons for the latter being made by Ford Madox Brown, Rossetti, and Morris. St. Martin's, Scarborough, is the epitome of the union of the arts. The central panel on the east wall is by Burne-Jones, the side panels are by Morris. The painting on the organ-case is by Mr. R. Spencer Stanhope. The chancel roof was decorated by Morris, assisted by Mr. Philip Webb, Bodley

* Apparently he is a year wrong in his age.

† Butterfield delighted in colour schemes; but he obtained his effects by coloured materials more than by paint.

himself executing the painting over the chancel-arch. Morris drew the cartoons for the paintings in the lower panels of the pulpit, a side panel being painted by Rossetti. All the windows are filled with stained glass, the early ones being made by Morris from cartoons by Burne-Jones, Ford Madox Brown, D. G. Rossetti, and Mr. Philip Webb. The decorations of All Saints,

Photo. Cyril Ellis.

FIG. 7.—CHURCH OF ST. MARY, CLUMBER.

Cambridge, and St. John's, Tue Brook, are by C. E. Kempe, the latter church having the wonderful Tree of Jesse covering the whole of the west wall above the low archway into the tower. What a list of collaborators—Rossetti, Burne-Jones, Ford Madox Brown, William Morris, Mr. Spencer Stanhope, C. E. Kempe, and Mr. Philip Webb! It cannot be denied that he was out of sympathy with the work of a younger generation; but no one can say with

truth that he was not keenly alive to the importance of collaborating with artists of the very first rank when he admired their work. He belonged to the pre-Raphaelite movement—though not to the Brotherhood – and he remained faithful to his ideals all through his life. To die "looking through a lattice-window" strikes the keynote of his mind, at least so far as churches are concerned. In house-work he realised the impossibility of adapting mediæval notions to modern requirements, and he never attempted it. I cannot recall a single example of a new domestic building by him in which the detail is Gothic, excluding of course what he did for the Colleges of Oxford and Cambridge. One of his latest works, the new buildings for King's College, Cambridge, the College has done him the honour to name after him, and in

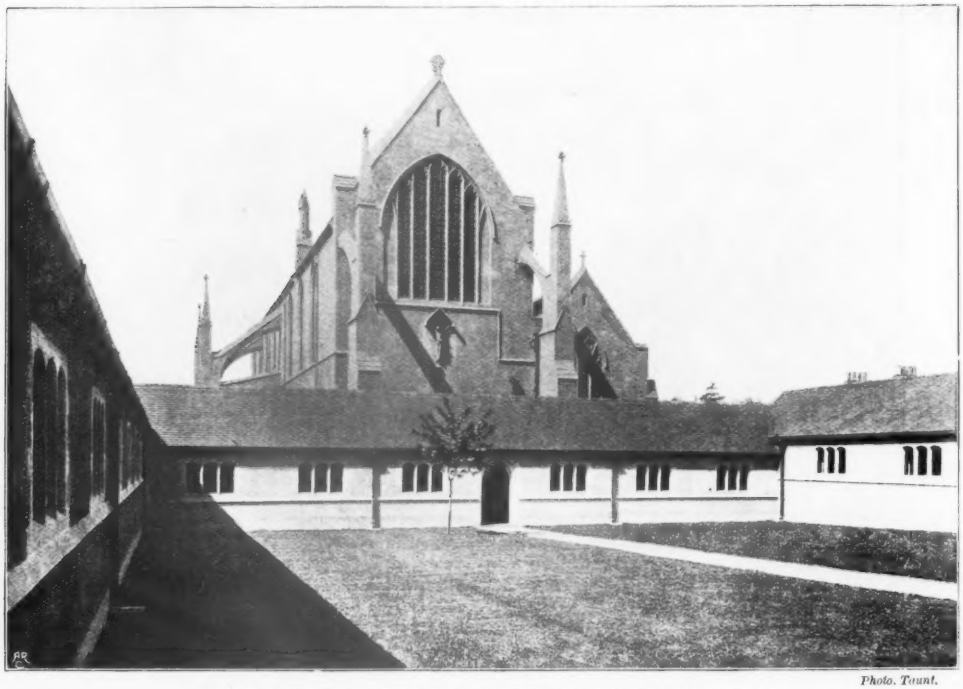


Photo. Taunt.

FIG. 8.—CHURCH AND MONASTERY OF ST. JOHN THE EVANGELIST, COWLEY, OXFORD.

doing so has honoured itself, and at the same time set a precedent which might well be followed elsewhere.

One reason why his work is so good, so complete in every part, is that he never allowed anything to prevent his carrying out his designs as he wished. If clients made suggestions he did not like and became importunate, he did nothing and permitted their letters to remain unanswered. He brooked no interference from anyone. In 1879 he added a narthex and another bay to his Church of St. Martin, Scarborough. Lord Grimthorpe, then Sir E. Beckett, was Chancellor of the Diocese. The plans, &c., were sent to him, and he returned the specification covered with marginal notes, accompanied by a request that these should be incorporated in the document. Mr. Bodley brought it to the office and said, "Simpson, will you please rub out these rude pencil notes, and then I will send the specification back." The notes were rubbed out, the specification returned, and I never heard anything more about the

matter; but as the alterations to the church were proceeded with at once Lord Grimthorpe probably saw the advisability of giving way.

When he first started practice he worked without assistance, practically without an office. One pupil came to him about 1856, and he did not take another for twenty years. When his

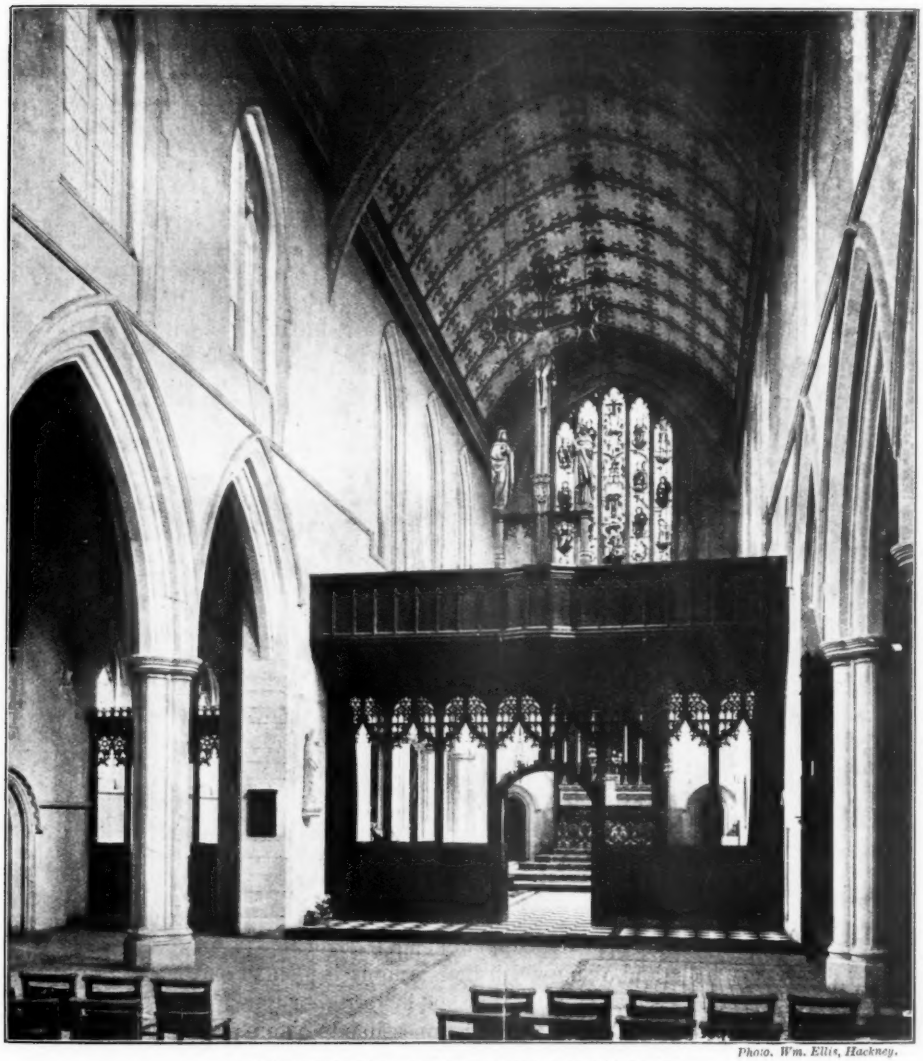


Photo. Wm. Ellis, Hackney.

FIG. 9.—CHURCH OF ST. JOHN THE EVANGELIST, COWLEY, OXFORD

mother came to live at 109 Harley Street, his brother William Bodley, the priest, took his affairs in hand, and used to make out his accounts for him. A story told of him is that he once got his pass-book from the bank, and found it so convenient a size for making notes in that nothing would induce him to return it. When it was finally recovered it was found to

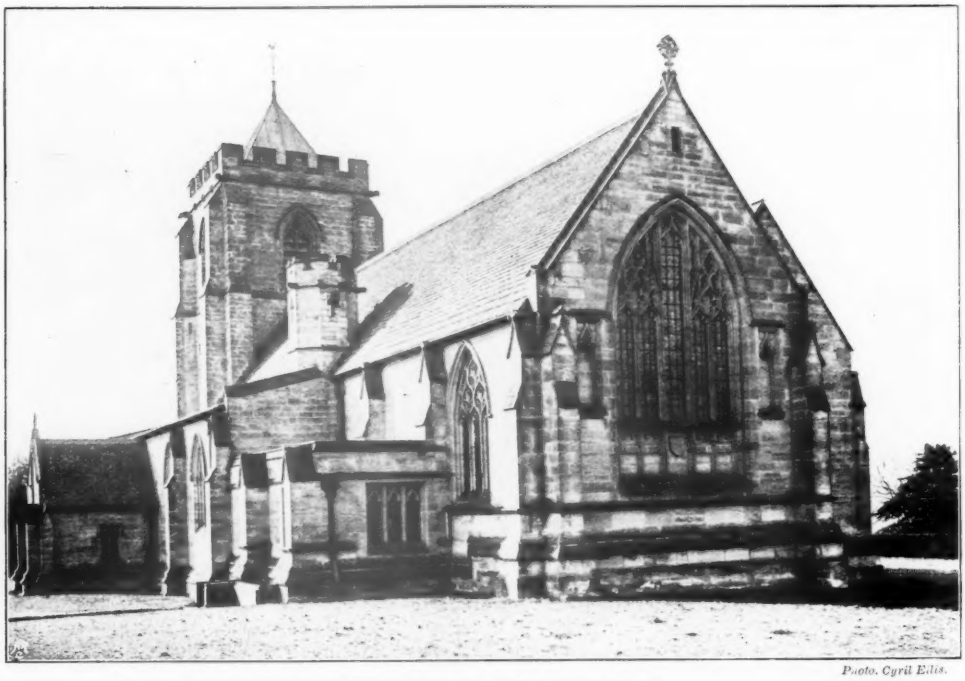


Photo. Cyril Ellis.

FIG. 10.—CHURCH OF ALL SAINTS, DANEHILL, SUSSEX.

be full of sketches, measurements, and memoranda connected with his work. As a young man, before his illness made it difficult for him to get about, he travelled a good deal, but he did not sketch much. He did what was far better, he studied. "Go to Venice and sit in dark corners of St. Mark's, for the good of your soul," was his advice the first time I went to Italy. When he saw a building he liked it is said that he lit a cigar and looked at the building until the cigar was finished, and never forgot it. His memory was a remarkably retentive one. He could describe churches he had not seen for twenty or thirty years as though he had visited them the day before. He could draw detail with a rapidity and a thoroughness which even Street, who also excelled in this respect, might have envied. He was only slightly acquainted with work of the present day, and very seldom expressed any opinion upon it. He had outlived most of his contemporaries; had outlived, to a great extent, the movement he had done so much to advance. To estimate his powers, his early work must be taken together with his later. If towards the end he kept to a somewhat well-trodden path, it was at least a path of which he knew every inch, and along which he had himself planted many flowers.

I have made this article personal rather than historical or critical, and I offer no apology for doing so. A complete list of his works is impossible to obtain; an incomplete one would be useless. No description of his buildings would convey their charm to those who do not know them; and nothing I could say would help those who do. It is stated that he had few friends; this is possibly so, but few men had so many staunch ones. Those who were brought in close contact with him felt an affection and admiration for him which few men inspire. His fine presence, stately manner, and old-fashioned courtesy, his charm—whether in writing or in speaking, his playful humour—all the more striking because his eyes alone showed that

he was conscious of what he was saying—and, above all, his kindness, account for the feeling with which those who knew him well regarded him. Even his slight hesitation in speech—sometimes approaching to a stammer—added a charm. He loved to surround himself with

Photo. Cyril Ellis.

FIG. 11.—ECCLESTON CHURCH.

beautiful furniture, pictures, glass, silver, old blue and white. If we pupils did not see as much of him in the office as we might have wished, we had the run of his drawing-room, and that alone was a liberal education. He was a musician of no mean order, not as regards technical skill—greater possibly can be heard nightly in half the drawing-rooms in London—but he played with rare expression and feeling. He was a poet, and had a poet's instinct, although

perhaps unable to express it fully in words. His volume of Poems, however, published in 1899, gives some indication of what was in him. One finds expressed there what one finds in his architectural work: his delight in colour and music, his love for English Gothic, his appreciation of beauty and dislike for ugliness, his reticence and his taste. He loved nature and was never tired of singing its praises. In his house at Iver, and later at Water Eaton,

FIG. 12.—CHURCH OF ST. EDWARD, HOLBECK. *Photo. Cyril Ellis, Alexandra Park.*

he revelled in the flowers, the old-fashioned ones especially, and rejoiced in the quietness of the country, away from the noise and bustle that he detested more than anything else in this world. He was the last of the band of "Goths" who made English church architecture famous throughout Europe in the latter part of the last century, and he was one of its leaders.

To Mr. Cecil G. Hare, his partner during his last year, his friend and companion for many previous years, I am indebted for much information and for kindly looking through this memoir before it was printed.

F. M. SIMPSON.

December, 1907.

SAFETY EXITS FOR THEATRES AND OTHER PLACES OF ENTERTAINMENT.

By S. Hurst Seager [*F.*].

Read before the Royal Institute of British Architects, Monday, 6th January 1908.

THE subject of safe egress from public buildings which Mr. Woodward brought before the Institute at our last meeting is one of such paramount importance that I very readily accept the opportunity offered me to place before our members, for their consideration and criticism, a method I have designed for preventing crushing at exits, to which I made slight reference at the meeting. I have the more confidence in doing this in that the method has already been carried out at some of the exits in two New Zealand theatres, with the result that the audience were able to leave that portion of the auditorium to which it was applied much more freely and quickly than under the previous ordinary arrangements universally seen. Fortunately there has been no panic since the alteration, but the ease with which the audience passed from the auditorium to the street without the slightest tendency to, or even possibility of, crushing confirms me in the belief (which the study of principles and their application in models had created) that I am justified in calling my method "The Safety Exit."

I have only lately had the opportunity of consulting Mr. Edwin O. Sachs's monumental work on Operas and Theatres, and many other essays on the subject to be found in the Institute Library. Though all writers are agreed that very much is needed to be done in order to make our places of entertainment safe, yet in none can I find any clear exposition of the principles to be followed, still less the method of their application to prevent crushing. Mr. Sachs's aim is to show what has been done by architects in modern times in designing opera-houses and theatres. This he has accomplished in a manner beyond praise, and he gives also an able comparison and summary of the methods which he finds have been adopted for the various parts. This is invaluable as a record of what *has* been done; but Mr. Sachs does not claim that the methods which have been in use are to be taken as examples to follow—at any rate not in respect to exits. On the contrary, he criticises some very severely and gives but qualified praise to the best; but such a hold has precedent upon us, so willing are we to follow example, that building after building is constructed in which are seen all the faults in the forming of exits which have led to such heart-rending fatalities in the past, and which will without question be the cause of fearful loss of life in the future.

To effect any improvement it is *principles*, not *precedents*, which must be carefully studied, understood, and followed. Several writers who describe, not what has been done, but what should be done, evidently consider that the last word has been said about exits in the

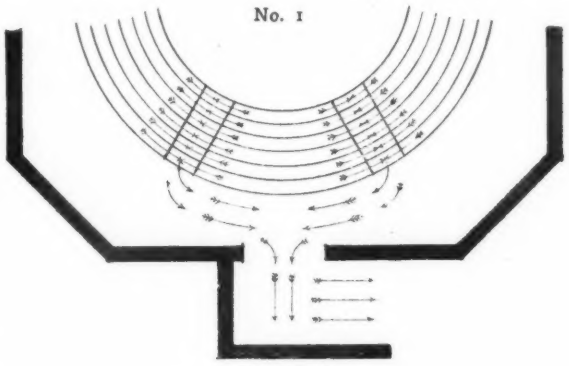
"Regulations" of the London County Council, for they rest content with quoting these or others based upon them. To my mind no greater error could be committed than to regard these "Regulations" as in any degree a statement of what is required to be done in order to make places of entertainment safe in times of panic, or even as convenient as possible on ordinary occasions. They merely state a minimum number and a minimum width of openings; they make no attempt whatever to show how they should be constructed. All who have studied this question of safe egress must have at once been led to the conclusion that the mode of construction of exits is of infinitely greater importance than their number and width. The Council's requirements leave it to architects to determine how, with the minimum number and width demanded, they may be made safe. That many places of amusement, lecture-halls, and places of worship, though fulfilling the requirements of the Council, would prove to be veritable death-traps in times of panic is beyond question. A very large proportion of the audience would never be able to reach the exits at all, and a great many more would either be crushed in them or in the corridors or stairs, and this because the elementary principles which should govern their construction have been ignored. The principles are so extremely simple, can be so readily understood, that they only need to be clearly stated to place at once in the possession of all a standard of criticism by which every work can be rightly judged. It requires the highest skill and considerable practice in planning to arrive at a perfectly satisfactory result under all conditions; but all who will take the slight trouble to understand the principles can at once determine whether or not the design of any building is such as will ensure, as far as possible, the safety of the public. No more important or fascinating problem is presented to the architect; yet, judging by results here and elsewhere, how very few have reached anywhere near the solution of it.

It cannot be too firmly insisted that the problem is not to design exits in such a way that the audience may leave the building without discomfort under ordinary circumstances, but to design those that shall be free from danger in times of panic, whether arising from alarm of fire or any other cause. That every part should be fireproof has been insisted upon with such force, and such stringent laws made for carrying it into effect, that there is a danger of being lured into a false security by regarding precautions against fire as the only needful ones to be taken. It cannot be too often insisted that safety to the public does not lie in the precautions against fire—important as they are from every point of view—but only in the power of the public to run away from that or any other apprehended danger.

It is often stated as a matter of congratulation, and as evidence of safety, that an audience has been timed to leave a building in so many minutes. This is quite delusive. The time occupied in leaving under ordinary circumstances is no criterion whatever as to the time that will be occupied in leaving when everyone is struggling to get out first. In the struggle to get out first at the Chicago fire 70 per cent. of the people in the gallery were killed, and yet we are assured by the architects that the exits were exactly double the width required by the American authorities—an appalling object-lesson which must be deeply laid to heart if we are to prevent such calamities in the future. Everybody knows perfectly well that pushing and the resultant crushing prevent any progress being made, yet unless the "queue" is firmly insisted upon it goes on to-day as in the past; how much less likely is it, therefore, that people will ever refrain from crushing when the fear that impels them is the danger of loss of life rather than the purely imaginary one of the loss of a seat. It must therefore be borne clearly in mind that the problem is not to be solved by demanding on the part of the audience a certain course of action under any unusual circumstances, for at that time the majority are incapable of thought, incapable of determining what action to take. Hence the false security created by placards on doors and notices of all kinds.

The problem, therefore, is to arrange exits so that, without any choice in the matter, perfectly irresponsible people in any portion of the building shall be impelled to move towards the one designed for their use, through which they must be able to pass to the street without any danger of resistance either from the structural arrangements or from opposing active forces. This, then, is the fundamental principle to be kept steadily in view as the ideal to be reached as nearly as possible. How this principle has been totally neglected in the past can be seen by reference to Diagrams Nos. 1 and 2, which represent very usual exit doorways from the auditorium, found unfortunately in nearly all public buildings, both "magnificent" and simple. The directions of progress to reach the exits are shown in each case by arrows, and it will be at once seen that here, as in the great majority of cases, highly dangerous resistance is met with at every turn. In the stalls at the ends of the seats resistance is offered either by the wall at right angles to them or by the mass of people moving, or trying to move, along the gangway towards the exit. When those who have succeeded in getting into the alley-way have reached the exit—and this, be it noted, is but a small proportion of the audience in this part—they are met by a directly opposing active force in those who are trying to reach the exit from the opposite direction. These forces, if exerted, being equal and opposite, perfect equilibrium is produced, or, in other words, no further movement could take place. The active force in the row A, although in the direction of the doorway, is not sufficient to overcome the greater pressure in the gangway, but it would by the resolution of forces act in a diagonal direction on to the jambs, thus forming for the moment a living arch—a trap from which a few people perhaps might struggle, but the same forces remain at work, and the trap is formed and re-formed as struggling or crushing break it. This is no mere theory—it is only what one would expect from a knowledge of the laws of mechanics, and can be readily demonstrated by models.

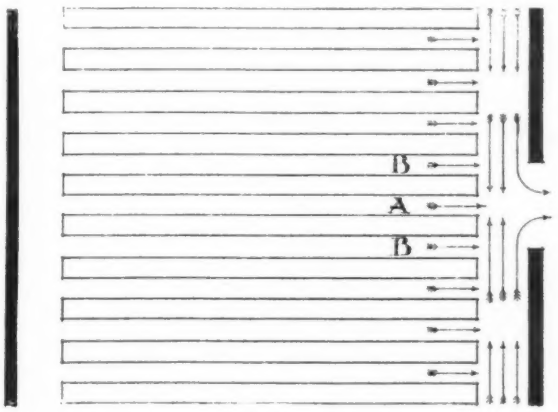
No. 1



DRESS CIRCLE.

SHOWING PRESSURE AT EXIT.

No. 2.



STALLS.

SHOWING PRESSURE AT EXIT.

In the plan of the "Circle" (Diagram 1) we have opposing forces in the stepped gangways, resistance from right-angled forces at the top of them, equal and opposite forces at the exit as in the stalls, and finally structural resistance in the wall opposite the exit. It will

therefore be seen that this method of forming exits is the one we should only think of adopting if the object were to create as much danger and consequent risk of loss of life as possible. Here then—as the records of disaster have proved only too often—lies the most serious source of danger in buildings for the assembly of the public, and the one to which attention must first be directed. I do not intend to go further at present than to show in what way existing buildings may be made as safe as possible; this is of far greater value for the moment than the putting forth what one may regard as an ideal scheme which, even if approved, might never be carried out.

Before doing this let me refer to one aspect of the question which has a very important bearing, but which is evidently misunderstood by at least one writer on theatre planning, who states that long straight passages are objectionable, because "a long straight passage, and more a long straight stair, is open to the danger of accumulated pressure." Now, it can be very simply demonstrated that in a straight passage—properly designed—whatever its length, there cannot possibly be any pressure at all, provided the sides are perfectly smooth, as they should be, and that it is of equal width throughout. Accumulated pressure is not dependent upon the length of a passage, but only on its width. This is a most important consideration, which must of necessity have great influence upon the designs of exits. In stating the fundamental principle I have said that exits must be free from the danger of resistance, for we must remember that motion in one direction, or pushing, cannot be converted into pressure unless there is something to push against, as projections at the sides of passages, projecting jambs of doorways, walls at a sharp change of direction, or, as we have seen, by opposing active forces. All these are objects of resistance against which pressure can be exerted. Without resistance there can be no pressure—without pressure there can be no danger. There is very great danger even in the pressure exerted by one person, but the danger is increased enormously when there is accumulated pressure—that is, when there is the pressure of many persons concentrated on one. Let us see, therefore, in what circumstances this can arise and consequently how prevented. I have said it is not dependent upon the length of a straight passage—in other words, it is not dependent in the slightest degree upon the number of people pushing one behind the other in a straight row. Under these conditions pressure cannot possibly be accumulated. Let me endeavour to make this clear. Imagine two men, A and B, of equal strength, hands on shoulders, steadily pushing with all their force one against the other; being of equal strength, and exerting it in the same vertical plane in opposite directions, there is of course no motion, the forces are exactly balanced. Now, behind one of them, say behind B, let a third man, C, also of equal strength, push B on the shoulders with all his force; A is still able to resist the force of both B and C, because the strength of B is now taken up by resisting the active force of C and transmitting that force to A. B is, in fact, now merely a buffer or strut between A and C. Add a fourth man, D, behind C, and both B and C will act as buffers between A and D, and so on, whatever the number of men pushing behind B. Throughout A would only have to resist the active pressure of one man. It would, of course, make no difference to the result if any number of men pushed behind A as well. A would then also be a buffer, transmitting the pressure of the last man in his row to meet the opposite equal force. The truth of this can, of course, be easily practically demonstrated.

We are now in a position to formulate the principle, that pressure cannot be accumulated through the exertions of any number of people if acting in a single row in one vertical plane. How, then, may pressure be accumulated? I have stated that it is dependent on the width of a passage, not its length, or, in other words, it depends upon the number of people that can stand shoulder to shoulder across the width of a passage—the greater the width the

greater the accumulated pressure may be if any resistance is offered. To prove this statement let us imagine what forces will be exerted if ten men push against a wall at right angles to the direction of the pressure, as shown in Diagram No. 3. Let one man, A, push against the wall, two men, B′ B″, push him from behind, three men, C C′ C″, push behind B′ B″, and four men, D D′ D″ D‴, push behind C C′ C″. Now we have the ten men arranged in four rows, A, B, C, and D, in the form of a triangle with the apex A against the wall, and all pushing with their full strength against the resistance the wall offers. It will at once be seen from what has been previously stated that the pressure on A is not that of the nine men behind him, but the accumulated or transmitted pressure of the four men in row D, which is transmitted along the dotted lines shown. Taking the strength of one man as the unit, the figures show the force exerted upon each man of the group—a force under which rows A and B must of necessity succumb, and probably the outer men in row C, so that out of this group of ten persons half at least would in all probability be killed under conditions which admit of the concentration of pressure in this way. It must be noted that this is the maximum pressure that can be exerted in a passage only wide enough to admit of four men standing side by side, for any pressure brought to bear on the men in row D would only convert them into buffers, as has been already shown. This maximum pressure, it will be observed, is created at a distance, from the wall or resistance, less than the width of the passage, and in the same way it can be shown that in a passage five men wide, five times the unit of pressure will be exerted, in one six men wide six times, and so on, and that in all cases the maximum pressure will be created at a proportionate distance from the resisting surface.

No. 3.

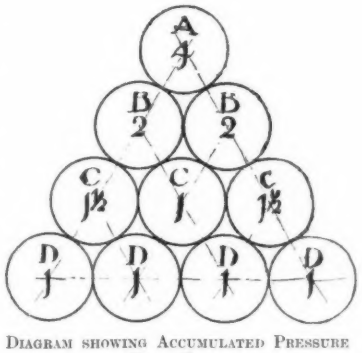
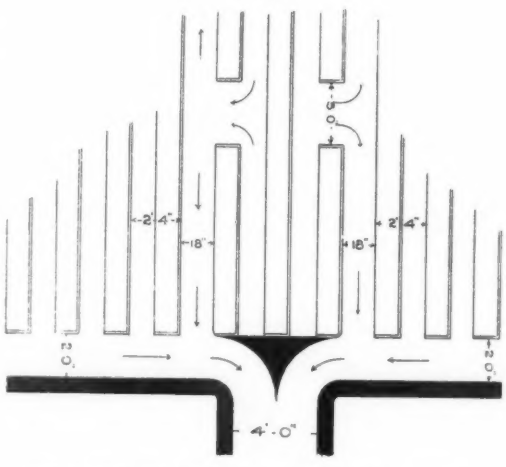


Diagram showing Accumulated Pressure of Four Persons.

The consideration of these truths leads us to another guiding principle. Wherever the conditions are such that oblique forces can be exerted accumulated pressures will result, varying in intensity directly as the width of the passage or space in which they are acting. Of course the greater the length of the wide passage or space the greater the number of people there may be under pressure if resistance is offered; but, as I have pointed out, the straighter the passage the less likelihood there is of any resistance being offered, and conversely the greater the number and the sharper the angles of change of direction in a passage the greater the risk will be that blocking will occur at one or the other of them.

No. 4.

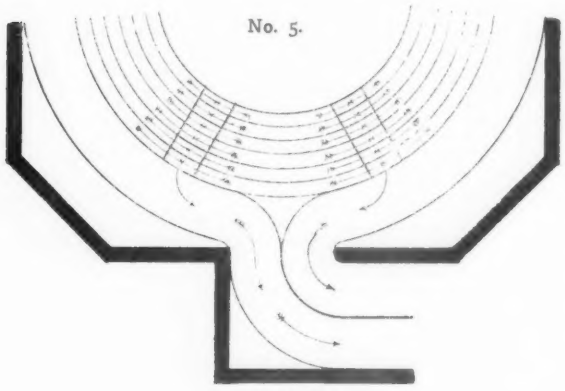


The Safety Exit Applied to a Four-foot Doorway.

From these considerations it is at once apparent that the maximum safety is reached

in exits one person wide throughout—from their seat to the street—that danger from oblique pressures begins with an exit two persons wide, and is increased directly as the number of persons increases in width of space occupied. Hence the great danger arising from any enlarged space in the line of egress, and the urgent necessity for dividing wide corridors with handrails to prevent any possibility of oblique pressures being exerted.

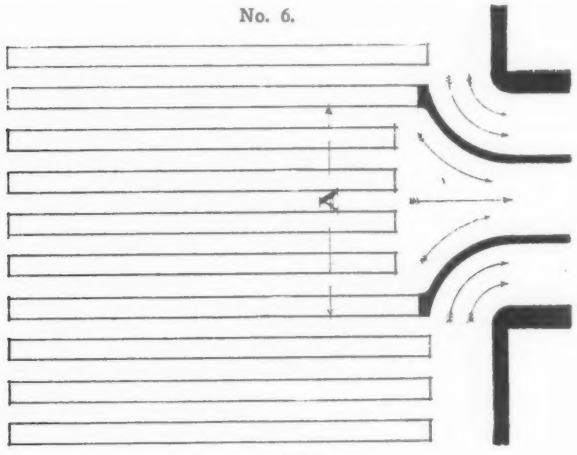
No. 5.



EXITS FROM SEATS.

Diagrams Nos. 4, 5, and 6 show plans of the Safety Exit already referred to. No. 6 shows the application to a doorway wide enough to be divided into three, No. 4 the application for a 4-foot doorway. It has for its aim the eliminating of all resistance to outward progress by means of curved solid dwarf partitions, which should be shoulder high, or about 4 feet 6 inches. They may be constructed of double plates of sheet iron, must be permanently and strongly fixed, and be perfectly smooth. The diagrams show the method of application to such an exit as that shown in Diagram 2. In the first case the outer divisions would be equal in width to the gangways at the end of the seats, and the central one proportionate to the number of people using it. In the second case it will be seen that the people behind the screen have as ready egress as those from other seats, and can reach the exit without meeting with resistance. By the use of this simple device any pushing would not create any pressure at the exit, but would only tend to hurry the audience more quickly into the street or corridor. The curve must have a radius greater than the width of the gangway; otherwise, if greater force is exerted by those close to the wall, they may at times create sufficient pressure against the portion of the curve opposite to them to create a block. With models I have occasionally succeeded in creating a block under these conditions, but never if the radius is sufficiently greater than the width of gangway to produce an angle of the resolved forces of under 45 degrees with the portion of its surface next the doorway. This is in accord with the well-known law relating to the reflection and conduction of sound, which will be found by experiment to apply to various bodies acting against a surface—modified only by the

No. 6.

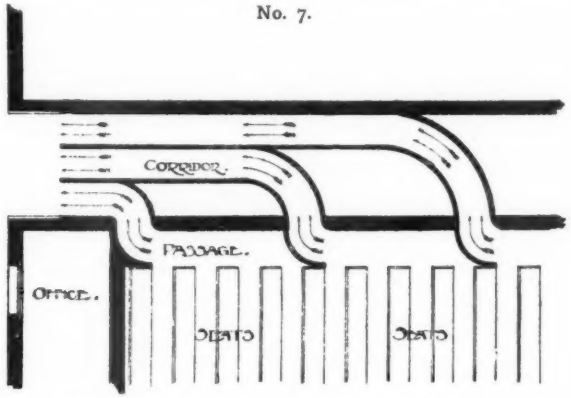


SHOWING APPLICATION OF SAFETY EXIT WHEN THE DOORWAY CAN BE DIVIDED INTO THREE.

varying frictions which the surfaces present. It will be found by experiment that if a person is forced against a wall at any angle between 45 degrees and 90 degrees the resistance offered will be complete; if at any angle between 45 degrees and 30 degrees the resistance will be partial, and part of the pressure converted into motion along the surface of the wall; if under 30 degrees the resistance is so slight that it ceases to provide any element of danger. From this it will be seen that merely rounding off right angles in corridors is not sufficient to produce absolute safety, although it will reduce the danger of blocking very considerably. There being no dangerous resistance, then, in the curve as fixed in the Safety Exit, the people can pass from the two gangways with perfect ease without the slightest interference from opposing forces. In passing from the block of seats A (Diagram No. 6) there may be some pressure exerted, but it cannot create a block, as none of the forces are directly opposed, either to each other or to the structural surface—they all tend to push the people out, and their safety is thus ensured.

Diagram No. 5 shows the application of the Safety Exit to the "Circle" shown in Diagram No. 1. It will be seen by the direction of the arrows that both active and structural resistance has been removed from the doorway, and what was unquestionably a death-trap converted into a perfectly safe exit. In this case—as in all cases where the exit from the auditorium opens into a corridor—the curved surfaces must be continued till the people are moving in one direction, as shown here and in Diagram No. 7.

No. 7.

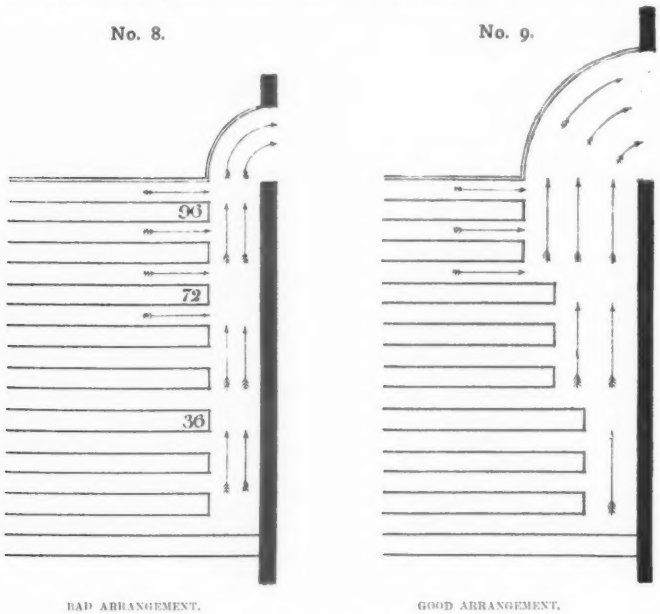


PLAN SHOWING ARRANGEMENT OF EXITS INTO CORRIDOR TO AVOID CRUSHING.

It will be noticed that in Diagrams Nos. 4, 5, and 6, although the safety exit provides for the easy progress out of the gangways, there still exists the pressure exerted by the people in the rows of seats pushing against those who have passed from them. I have shown that whatever the number of people in the row, only the pressure of one person can operate at the end of it; this pressure being at right angles to the direction of the forces in the gangway could not produce equilibrium, but it would be sufficient to considerably retard the flow of the people towards the exit, and should, therefore, be eliminated as far as possible. In the great majority of instances the gangways are of even width throughout, as in Diagram No. 8. How unscientific this is can at once be seen by noting that while only thirty-six people have to pass point A, seventy-two must pass point B, and ninety-six point C. Yet all are of equal width. This has been recognised as a defect, and it has been suggested in America to make the gangway increase gradually in width towards the exit; but this I hold to be out of accord with the principles which should govern gangway and corridor construction, for the following reasons. It will be noted that I have spoken throughout of the widths of corridors as based on the unit width of the people who are to use them. I have done so because my experiments have led me to the firm conviction that unless this is done there is an element of danger in them in times of excitement, which does not yet appear to have been apprehended. The width of adults across the shoulders may be taken as varying from 16 inches to 24 inches. This gives an average width of 20 inches, but as there are certainly a far greater number nearer

maximum than the minimum, we may, I think, safely take 22 inches as the unit of width required for free egress of each person in all exits, if for a greater number than two. If a gangway or division of an exit is intended for the use of one or two people the maximum width of 24 inches should be taken.

The effectiveness of any exit depends solely upon the number of people who can pass through it in a given time—this is a truism, yet it appears to have been wholly disregarded in the greater number of instances, both in England and elsewhere, or the rule would never have been laid down, and apparently generally accepted, that "corridors shall have a minimum width of 4 feet 6 inches if for the use of not more than four hundred persons, shall be 5 feet if for the use of five hundred persons, and shall increase in width at the rate of 6 inches for each additional one hundred persons." Now, apart altogether from the question of sufficiency or insufficiency of these requirements—which I do not now propose to enter upon—let us consider what underlying principle, if any, there is to be found in them.



PASSAGE-WAYS AT ENDS OF SEATS.

Placing the widths arrived at by multiplying the stated unit measurements, and the rules which have hitherto been adopted side by side, we have:—

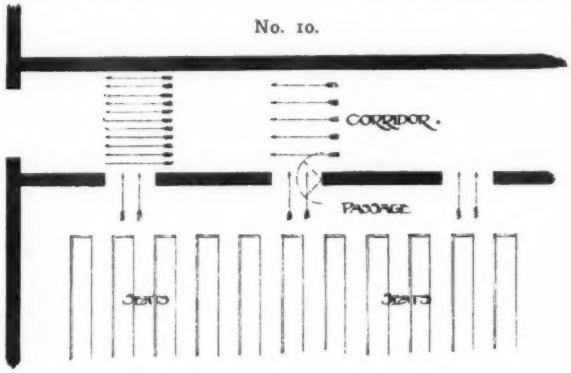
UNIT MEASUREMENTS		ADOPTED RULES		
Person	Width required ft. in.	Number of People	Width ft. in.	Effective Width
One	2 0	400	4 6	Two persons
Two	4 0	500	5 0	,, ,,
Three	5 6	600	5 6	Three ,,
Four	7 3	700	6 0	,, ,,
Five	9 2	800	6 6	,, ,,
		900	7 0	Four ,,

It will thus be seen that 4 feet 6 inches is a two-person exit, but is 6 inches wider than the very liberal space allowed under unit measurements. That 5 feet is 6 inches too narrow for the free use of three people, who require, as shown, 5 feet 6 inches, the width adopted for 600 people; from this number there is no increase in efficiency till the width adopted for 900 people, which, it will be seen, is 3 inches narrower than it should be. This cannot be a matter of surprise when we reflect that the increase of width asked for is less than the space required for one-third of an average person. I think we may, therefore, call them unprincipled widths, and must regard them as possessing on this account an element of danger which should not

exist. The element of danger lies not so much in the fact that it would take, say, 700 people one-sixth longer to escape than 600, but rather in the fact that by those irregular widths lateral pressures may be set up tending in two different ways to create a block. In the latest regulations of the L.C.C., it is true, the unsafe minimum width of 4 feet 6 inches is deleted, and the safe two-person 4 feet minimum adopted.

Though these new regulations of 1906 demand infinitely greater security than those which have hitherto been in force, still I venture to think that they may still be improved in several important particulars. It is unfortunately the old ones of 1900 that are continually quoted and are held up in all the text-books as guides to follow, making it extremely difficult for those of us whose practice lies outside the sphere of influence of the Council to persuade the proprietors of buildings for public use, and those having control of them, that something much more is needed to be done than those old regulations demand. The retention of the 5 feet width, although not presenting so serious an element of danger as the 4 feet 6 inches one, must be regarded as an oversight when we reflect how easily possible it is for three people above the average, or three men of average stature to block it by forming a segmental arch across it. Let us consider the conditions under which this might arise. It will be seen that three persons having the average width across the shoulders of 20 inches would just tightly fill the width of the corridor; they could not walk easily side by side. Three men of an average width of 21 inches would, if they tried to squeeze in, form a flat segmental arch having a rise of about 8 inches, and a thrust against the side walls, making with them an angle of over 60°—a thrust which, as we have already seen, would meet with complete resistance. An arch of this kind would certainly be an unstable one, but there is danger in it; for we can easily realise that the three men thus held by the lateral pressure would be striving to break from it with such force that they would, on the arch breaking, be impelled forward so rapidly that in all probability they would be thrown down, and thus cause danger to all who follow. Again, if three men, 22 inches wide, got blocked in the same way they would form an arch having a rise of 12 inches, and exert a thrust on the walls at an angle of over 45°. This, it will be remembered, is also one which offers complete resistance, but the arch now is of more stable form, and the danger in this case is of those forming it creating a complete block and succumbing to the great pressure that can be brought to bear upon them. The probable danger arising from these causes can be reduced to a minimum, if not wholly eliminated, by making the corridor sufficiently wide for three average men to just fill it comfortably—namely, 5 feet 6 inches as stated. With a 5 feet 6 inches corridor it would, of course, require four people to form an arch, but it will be found that four persons of the average width of 20 inches would form an arch with so high a crown that the thrust would fall on the walls at an angle less than 45°, and, therefore, not sufficient to offer complete resistance. In this case, therefore, no dangerous pressure could be brought to bear upon it, still less if four average men of 22 inches width form the arch, for in this case it would so nearly approach a

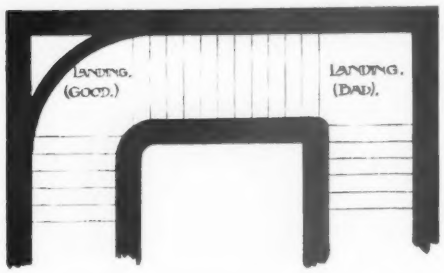
No. 10.



PLAN SHOWING BAD ARRANGEMENT OF EXITS INTO CORRIDOR AND REDUCED WIDTH IN DOORWAY.

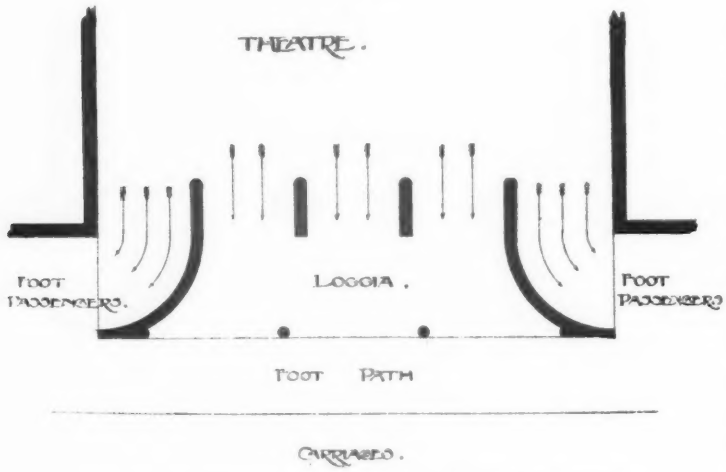
semicircle that the resistance offered by the walls would be a negligible quantity. I am well aware, as we all must be, of the extremely variable conditions likely to be set up against which it is impossible to provide scientifically, but if we are convinced that there is any possibility—even suppose we think it remote—of normal conditions, such as I have shown, producing any element of danger, then I think we should endeavour to avoid it by asking for the extra 6 inches. In all cases where corridors are broader than required for the easy progress of any given number of people side by side it should be demanded that they should be reduced, or divided, to avoid all possibility of people rushing in to fill small vacant spaces, and thus creating those lateral pressures which we have seen to possess such an element of danger. It may seem without reflection as a paradox to consider a 4 feet exit as of greater value than 4 feet 6 inches, but when we note that in the latter case three persons of average width of 20 inches, as also those of the average width of 21 inches and 22 inches, are able to block it in the way I have explained, it will be recognised to be a width that should never be adopted. This principle must apply to all portions of the exit, and therefore to gangways, as shown in Diagram No. 9, in which it is seen that, while no seats are lost, all the people in the three groups of three seats have an equal chance of leaving them without risk, and in comfort. In Diagram No. 10 we have illustrated the enormous danger existing in the exit doors from the auditorium opening into a corridor, and the increased danger by reason of the reduced width of the outer doorway, while Diagram No. 7 shows how by the application of the principles enunciated it may be made perfectly safe with but an insignificant outlay, but in this as in all cases where there is imminent danger, the cost of reducing it should be the last consideration. Diagram 11 shows the stairs demanded by the London County Council regulations altered in accordance with the principles laid down—keeping the exit of even width, and making the change of direction against a non-resisting surface. Diagram 12 is a suggestion for preventing that confusion which now exists at exits in the street. The

No. 11.



Plan of Stairs as recommended by London County Council, and Suggested Improvement.

No. 12.



Plan showing Suggestion for Preventing Crushing at Entrances.

planning of these would depend wholly on the circumstances of the site, but such a plan might prove of the greatest service under favourable conditions. That the planning of places of entertainment should be symmetrical has already been insisted upon. If this is carried out it would add both to the comfort and safety of the audience by ensuring that those who approach the building from the right would occupy in all the unreserved places the right-hand seats, while those on the left would be those who have approached the building from that direction. Hence on leaving there would tend to be two unimpeded streams of people rushing from the building in the direction of their homes.

I have said that the new London County Council regulations should be amended—in what direction the principles I have brought before you will, I think, show. For it will be seen that they cannot possibly be regarded as guides to follow unless they demand :—

That the exits shall be based on a unit measurement corresponding to the average width of adults.

That all exits shall be of even width throughout.

That if any increase is made in the width on the line of egress, that width shall be maintained to the street.

That the walls of all corridors shall be perfectly smooth to a height of 5 feet.

That every change of direction in the exit shall be made by means of curved non-resisting surfaces.

That the exit from any part of the building must in all cases be also the entrance.

That every precaution shall be taken to keep the exits unimpeded by carriages or people.

If these necessary requirements are fulfilled we may, I think, rest assured that our places of entertainment will cease to be the death-traps many of them unquestionably are, and that we shall have done all that lies within our power to provide safe egress for their patrons.

DISCUSSION ON MR. SEAGER'S PAPER

The President, Mr. Thomas E. Collcutt, in the Chair.

Prior to the reading of the Paper, the President reminded the Meeting that the Paper was in the nature of a supplement to Mr. Woodward's Paper read at the last meeting, and that the author, an Associate of many years' standing, had just been elected by acclamation to the Fellowship of the Institute.

Mr. WM. WOODWARD, who rose at the invitation of the President, said he had much pleasure in proposing a vote of thanks to Mr. Seager ; he did so with the more pleasure because Mr. Seager was from New Zealand, he had been admitted a Fellow of the Institute that evening, and he had shown by the scientific treatment of his subject, and by the excellent way in which it had been read, that a comparatively dry subject might be made, and had been made by Mr. Seager, most interesting. The elucidation of the principles which Mr. Seager desired to set forth had been so perfectly clear to all of them, his diagrams and his descriptions of those diagrams had been also so perfectly clear, that very little indeed remained for one to say upon the Paper itself. He entirely agreed with Mr. Seager that they ought not to attach too much importance or place too much reliance upon fire-resisting or fire-proof construction in theatres. The danger that existed was in the desire to get from the building, and the importance of getting from the building quickly was so great that the fact of its being fire-proof or fire-resisting had very little influence upon the loss of life which might occur. In cases where fire had occurred in a theatre or similar place of amusement, the danger they had to fear arose from panic and want of consideration. The principal danger consisted in the confluence of persons coming from different parts of the building : and the circular passages and the circular ends to the corridors which Mr. Seager had so clearly shown upon his drawings must convince them, and he thought must convince the London County Council, that it was very desirable that they should amend their requirements with regard to these exit corridors. He quite agreed with Mr. Seager that it was a danger to have a corridor too wide or too narrow ; and although the proportions of the human form might not exist in all cases as shown, Mr. Seager had given them a very good average indeed for the ordinary human being.

Another important point was that the so-called crush-rooms were in themselves a very serious danger. As Mr. Seager said, instead of being crush-rooms they might be more properly called crushing-rooms. It was there that the danger existed, that the rush and crush in case of excitement would take place, and that the greater number of lives would be lost. Another important point with regard to Mr. Seager's plans seemed to be the entrance. He quite agreed that in desiring to leave a building one's natural tendency would be to make for the door by which one had entered; and if, instead of the usual square angles found in most theatres, curves such as Mr. Seager suggested were substituted the danger would be very much minimised. With regard to the corridors, Mr. Seager's models showed that the multiplication of corridors need not be unsightly, because they need not be higher than four feet six inches: that would not shut out the view of the interior, and they would not form unsightly additions to the building. He trusted that the London County Council would give some attention to their friend from New Zealand, who was evidently thoroughly versed in the American modes of exit. Perhaps they might be disposed to give more consideration to him than they would to a London architect reading such a Paper. He was sure they all greatly appreciated the Paper that evening, and were much indebted to Mr. Seager for the trouble he had taken in its preparation. If they could have other architects from the Colonies to give them the benefit of their study and experience they should be only too pleased to welcome them at the Institute.

Mr. GEORGE HUBBARD, F.S.A. [*F.*], said he seconded the vote of thanks very heartily and cordially. He could not help feeling that all who had listened to Mr. Seager's most excellent Paper must be extremely grateful to him for the very lucid way in which he had laid this complex question before them. Mr. Seager had enunciated a scientific truth upon which there could be no discussion; he had clearly and scientifically laid before them the fact that the audience were parts which had to move out of the building with the least amount of friction, and he had shown them the way in which that could be done by his diagrams and models; he did not think any could forget the lesson he had taught them. It was one of the most scientific Papers he ever remembered to have heard in that room. There was only one point upon which he should like Mr. Seager's opinion. He had impressed upon them that in times of danger people were apt to lose their heads, and do exactly the thing they should not do. He thought this might happen in the case of such an arrangement of exits as that shown in Diagram No. 7. A person might feel sorely tempted to jump over the back of his seat and make for the nearer exit which should rightly belong to another set of seats. By so doing he would increase the amount of crush in one exit, though he might relieve the crush that would be going down another.

Mr. W. H. ATKIN BERRY [*F.*] said he should like to endorse the appreciation which had been expressed by the proposer and seconder of the motion, of the very valuable Paper Mr. Seager had brought before them. He should like, however, to ask a question on one point—viz. as to how one man could resist the pressure of four, as stated by Mr. Seager. If that were so, he thought that the principles of statics and dynamics must have altered since his school days, because he could recollect the unfortunate boy sitting at the end of a bench being called upon to resist the pressure of all the other occupants of the bench, and finding himself on the floor, to his great discomfort, and perhaps having to suffer punishment for making a disturbance! Perhaps Mr. Seager would enlighten him a little more upon that point. Passing to the diagrams, the same question occurred to him with regard to Diagram No. 4 as Mr. Hubbard had suggested with regard to another plan. They could not rely upon all the people leaving their seats in the same calm and orderly manner as the arrows showed they ought to leave. It seemed to him that, instead of going along the line of the arrows, people in panic would rush over the benches, and so create a block with those coming along another line. In another place, too, on the same diagram, they would meet those opposing forces which Mr. Seager had cautioned them against. Perhaps Mr. Seager would give some explanation of those points also.

Mr. ROBERT F. HODGES [*A.*] asked to be allowed to express his appreciation of Mr. Seager's interesting Paper, and to put one or two questions to him. Up to some six years ago he had held for nearly fourteen years a position as surveyor of theatres and music-halls under the Metropolitan Board of Works and London County Council. He thought one or two of the arrangements shown on the diagrams needed reconsideration. Mr. Hodges proceeded to criticise these and to draw attention, from the plans, to troubles which might arise in connection with sloping floors and varying floor levels at the points of exit from gangways, and the temptation to people to climb over seats by way of short cut to these exits. He felt sure that the Council would never sanction a 2-foot gangway being substituted for that of 3 feet 6 inches, as required by their regulations. One reason against this would be obvious. It would be utterly impossible to provide even standing room in a gangway of, say, 30 feet by 2 feet, for anything like the number who would seek to use it, and slow progress and absolute blocking would be inevitable. Mr. Seager did not show how he would place or hang his doors. The swing doors as shown on one plan would cause obstruction, and draughts might result from the various openings and passages. The people to be

most considered were those farthest from the street. Exit from the ground level was more or less easy in most of the modern theatres. There were other matters, too, of great importance, such as the hand-rails and the condition of the so-called automatic bolts, which very often were anything but automatic. The bolts often got out of order; the holes that the bolts slid into became filled up with rubbish, and consequently the bolts would not work, and the doors would not open. Automatic bolts should be in such order that they would open with the slightest movement.

MR. MAX CLARKE [*F.*] said he should like to add his quota of praise to Mr. Seager for so clearly elucidating his views to them. Mr. Seager, however, seemed to put fire-resisting construction in the second place, and good exits in the first place. That, he thought, was not a correct point of view from which to look upon the construction of public buildings. Everybody who had ever designed a theatre or music-hall had had it in his mind that the people would wish to get out in the most rapid manner, and anybody who had ever had anything to do with it had also had in his mind that the thing they arranged for the people to do they would not do when there was a panic. The serious fires which had occurred in many theatres of the world were fresh in the memory of the public, and nothing that one could do would persuade them that such things could not occur again. Given a theatre built of absolutely incombustible materials, the only thing to burn being the stage equipment, it seemed to him that one would be quite safe in moderating the speed of leaving the building. He had several reminiscences in his mind, but they were not very pleasant ones, and he had better not therefore relate them; but he remembered distinctly making a drawing and providing for a window to be put in a certain place so as to allow means of escape in case of fire. The window was put there: a fire occurred, and the men in the building never thought of opening the window, and two of them were burnt. That was his point. This theoretical idea was most excellent, and, so far as one could, it was advisable to carry it out. If Mr. Seager would show them a complete set of drawings with this arrangement carried out, he thought it would be a wonderful revelation, because, as a general rule, in London one had to put a theatre upon a site which was somewhere between 20,000 and 60,000 superficial feet; and if a certain number of people could not be got into that place it would not pay. If more than £60,000 were spent upon it, it would not pay either, and to do all those things and to carry out the County Council's requirements was a most difficult thing to do. He knew exactly the theatre that Mr. Seager described in which some of those landings were. Some of the arrangements shown on the diagrams were most excellent; but in the case of others, as previous speakers had pointed out, the people would jump over the seats, and would not think for a moment to go out as they should do. But that was only because it was impressed upon the mind of the public that the theatres were not fire-resisting. When theatres were built that would not burn, then people would be satisfied to go out at a leisurely pace; and if they did, they would be out of most London theatres in less than ten minutes. What he would like to see the County Council do (if they were going to revise their Regulations) was to prohibit the present form of screen to the proscenium, which was made of two thicknesses of asbestos cloth. That, he thought, was the most lax arrangement that the County Council had perpetrated for a great number of years. He had always been under the impression that if one put six men in a row, and gave them a good foothold on the ground, they would exercise more force than one man standing at the end. If there was no friction, and the surface to stand upon was perfectly smooth, then he did not think they would. Whatever chance the experiment had of succeeding, if conducted on scientific lines and with an equal and continuous pressure in one parallel direction, it would not resemble a crowd of persons pushing first in one direction and then in another, and swaying about. He would take an opportunity of trying the experiment as early as possible, just to see what would happen. At the present time his mind was not convinced. That did not, however, prevent his expressing how very pleased he was to hear some new development of this exit question, because it was only by the new developments that they would ever get any further on; and although some of the arrangements shown were, he was afraid, somewhat extravagant in the way of space, still, if they had the opportunity and the space and the money, there was no reason why they should not be done; and if they did them they would certainly be better than the present arrangements.

MR. S. HURST SEAGER [*F.*], in reply, said he should like to thank the Meeting for the kind way in which they had received his Paper. He could but think that it was because they regarded him as a stranger; but it was hard to realise he was a stranger when he found himself among such excellent good friends. He could assure them that it was an extreme pleasure to him to have an opportunity of coming from the other side of the world, and meeting those who were so well known by name to them there. He had been in the Colonies —or, as they had now become, the Commonwealth of Australia and Dominion of New Zealand —for twenty-three years, and could assure them that all the names to which he could now attach such interesting personalities were as well known and revered on the other side of the globe as here in London. In reply to the criticisms he might say that he did not for one moment intend to bring before them details of construction, for there

were many present far more fitted than himself to carry out the principles enunciated. He only wished to bring before them some principles which the present methods of construction led him to believe had not been fully recognised. If these principles were recognised as those upon which construction should be based, then—with the amount of architectural talent among members present—they would without question be carried out in the most scientific and artistic manner. Mr. Max Clarke had spoken of the knowledge of a building being fireproof as being a safeguard against panic. They had only to remember that the Chicago building was known to be fireproof, and it was proved to be by practically no damage being done to the structure; yet 70 per cent. of those in the gallery were killed. It was no use telling people to sit quiet and it would be all right. When they saw a fire start in any part of the building, they would not stop to think. They would simply rush, and rush as quickly as they could. Then with regard to the diagrams, he must ask them to remember that they were simply rough ones hastily prepared, and intended to show principles only. He did not perhaps make it sufficiently clear in his Paper that he was dealing only with those imminent dangers which exist in present buildings, and showed methods of overcoming those dangers—if not wholly, at any rate to a very great extent. He did not claim that the alterations shown formed an ideal arrangement. If he had to start *de novo* to design a building for public use he would work wholly on the principles laid down, but it would in that case be unnecessary to resort to many of the expedients his diagrams suggested. He considered that the most perfect method that could be adopted was that by which all had the opportunity to rush from the ends of their seats direct to the street, or into corridors with non-resisting surfaces, whence they could pass into the street without any resistance being offered. All they could do for existing buildings was to minimise the very great dangers to be found in the great majority of buildings here and abroad.

MR. H. HEATHCOTE STATHAM [*F.*] [*pointing to a diagram*]: Are all the entrances shown there exits as well?

MR. SEAGER: Yes.

MR. STATHAM: That would mean a very large staff.

MR. SEAGER: There was now one entrance for each part of the house. It simply meant that the entrances would have to be doubled, and a man would have to be there for an hour or an hour and a half, at a cost of a few shillings each night. There were doubts still existing in the minds of some as to the truth of his statement that one man could withstand the pressure of four. The illustration offered to them of a boy being pushed off the end of a bench was not proof necessarily that he was wrong, because the impact had to be counted there. If several boys got up any degree of speed, and pushed the other off, it was the momentum which had been created by the motion that caused the fall. That was rather a different principle.

MR. MAX CLARKE, referring again to the Chicago fire, said that the theatre was not finished. It had no hydrants and no fire-resisting curtain. The stage paraphernalia caught fire, the people were frightened when they saw that the curtain would not come down, and that created the panic.*

MR. R. F. CHISHOLM [*F.*], writing since the Meeting, says:—

Mr. Seager's admirable and interesting Paper on Safety Exits deals only with those accidents which arise from blocking; but the most serious loss of life occurs from people falling and being pushed down in the frantic rush of a panic, and no power can prevent such accidents but individual control on the part of those forming the crowd itself. Prevention in such a case is much better than cure, and if leaving and returning to school in an orderly manner formed part of the daily instruction in all schools, there might be little loss of life from panic later on. We know how the presence of mind of a young girl playing the piano averted a stampede.

I think it would simplify Building Acts and Bylaws if the single word "gangway" were used to designate stairs, corridors, and passages. A corridor is a passage, but a passage is not necessarily a corridor. Compare Amendment Act, 1878 part 1, section 15, with London Building Act, 1894, clause 80, section (*c*).

* The following are extracts from the verdict given by the coroner's jury on 25th January 1904 at the inquest held after the fire at the Iroquois Theatre, Chicago:—

"Grand drapery coming in contact with electric flood or arc light situated on iron platform on the right hand of stage facing the auditorium."

"City laws were not complied with relating to building ordinances regulating fire-alarm boxes, fire apparatus, damper or flues on and over the stage and fly galleries."

"We also find a distinct violation of ordinance governing fireproofing of scenery and all woodwork on or about the stage."

"Asbestos curtain totally destroyed, wholly inadequate considering the highly inflammable nature of all stage fittings, and owing to the fact that the same was hung on wooden battens."

"Building ordinances violated in closing aisles on each side of lower boxes and not having any fire apparatus, dampers, or signs designating exits on orchestra floor."

"Building ordinances violated regulating fire apparatus and signs designating exits on dress circle."

"Building ordinances violated regulating fire apparatus and signs designating exits on balcony."

I only give the above, as they show that, although most of the theatre was of a fire-resisting nature, it was defective in so many respects that it could not have been worse if built of wholly inflammable material, and it is a lesson to authorities with regard to fire-resisting curtains.

MAX CLARKE.

9, Conduit Street, London, W., 11*th January* 1908.

CHRONICLE.

The Parting of the Ways.

To-day, for the first time since ten years, this Journal makes its appearance under another guidance than that of our late Secretary; and I am asked to contribute a few lines to mark the occasion, and express—as well as I may—on behalf of the general body of members of the Royal Institute, the sincere regret which they feel at his resignation of the office he had held so long and filled so well. It is with a reluctant diffidence that I do so—I am too close a personal friend of Mr. Locke to pretend to impartiality in speaking of him—yet, I think perhaps the members themselves would wish their tribute of appreciation to be not too impersonal, too nicely weighed, nor closely calculated. For, after all, we are bidding Farewell! to a man who has made himself the friend of a whole profession. Unvarying, unaffected courtesy has been extended to us all, whether in time of slumberous peace or of rousing combat; and the charm of his own comity has had its softening influence upon the acerbity of our necessary polemic. This is not the place, nor am I the proper person, to speak of his work as a Secretary, his relations with our colleagues abroad, or of his brilliant achievement in literature. It is a commonplace in Art that distance, both of time and place, is essential to correct appreciation; but I will hazard the prophecy that those of us who live to look back on the period of Mr. Locke's Secretaryship will mark it as a time of great advance in the position of the Royal Institute, and will allot to him no small share in its progress.

It is, as I know, with real sorrow that he has left us, although, as all hope, with pleasant memories; while we, uncertain yet of the full measure of our loss, entwine our wreath of regrets with gladness for the manner of his going, and wish him—God-speed!

"Farewell!
The charter of thy worth gives thee releasing."

John W. Simpson.

Honours Examination in Architecture.

At the Business Meeting of the 6th January, Mr. Charles R. Guy Hall [*F.*], in accordance with notice, brought forward the following motion, viz.: "That the Council be desired to consider the advisability of holding an examination in Honours, and to report to a General Meeting." Mr. Hall said he was not suggesting that an examination should be set up of an academic character. The Examinations of the Institute, which included papers on Construction, Materials, Specification Writing, and Professional Practice, were most excellent, and went to the root of their respective subjects; but, as regards the sphere of actual building, the subjects to which the candidates were limited consisted of a detached villa, a local parsonage, or buildings of that description. He was conceiving in his own mind an examination which would prove of benefit and of assistance to architects in practice. Having emerged from the atmosphere of the Institute Examinations, it was necessary for them to specialise in one specific branch of architecture, and possibly in more than one branch. It seemed to him that the Institute did not come to the assistance of the individual architect as much as it might do. The sphere of practical architecture was divided into some eight branches—viz. (1) Residential Architecture, consisting of town houses, flats, and country houses; (2) Commercial Architecture, consisting of banks, hotels, and business premises; (3) Municipal Architecture, consisting of town-halls, public libraries, baths and washhouses; (4) Educational Architecture, consisting of schools, colleges, and technical institutes; (5) Ecclesiastical Architecture, consisting of cathedrals, churches, and chapels; (6) Medical Architecture, consisting of hospitals, convalescent homes, and asylums; (7) Theatrical Architecture, consisting of theatres, music-halls, and concert and assembly rooms; (8) National Architecture, consisting of monuments and public buildings. The Institute, he thought, would come to the assistance of the individual architect if it were to schedule and tabulate the literature bearing on each of those specific divisions of architecture. At the same time the Institute might give them plans of two or three of the most recent buildings erected, and, above all, make arrangements by which an architect could inspect those buildings, so as to see not only a portion of the structure, but the working of the building, its heating and ventilation, &c. The architect would in that way acquire knowledge in a much more practical manner, and in much less time than if he were left to "rough-hew his ends" as best he could. He was doubtless suggesting, not merely one examination, but a series of examinations; so that the architect who found his practice giving out, as it were, in residential architecture, might be able to specialise in another branch, and submit himself for examination in that branch. It might be said that this

would involve the laying down of a vast amount of efficient machinery; but it must be admitted that they all had to attain this special knowledge, and when the Institute Examinations only required of them a knowledge of a detached villa or some simple building of that kind, they could not go into action as well equipped as they ought. If there were any branch of medicine or surgery, for instance, which it was necessary for a medical practitioner to be acquainted with, not only would an examination be held in it, but the subject would be fully mapped out and surveyed for the physician or surgeon who required to be equipped in that particular branch.

The PRESIDENT asked if it was the practice among physicians and surgeons to have an examination for Honours in any special branch of their profession.

Mr. GUY HALL said he believed that the symptoms of every disease that man could be afflicted with were entirely diagnosed and put before the candidate; and the latter would be required to diagnose the particular complaint, and show in what manner it should be treated. He should say that there was no department of medicine or surgery which was left unexamined upon. In the architect's case there was no special examination whatever. He entered practice after passing an examination in what might be called an elementary branch of architecture, and imagined he was equipped for his profession; but he quickly found that he was not, and to specialise in any one of the various branches meant a very big business. He would leave the proposal with the Meeting; if they thought it was sufficiently workable and practicable and sound it might meet with their approval.

Mr. WM. WOODWARD [*F.*] said he remembered a good many years ago a work being brought out on Dilapidations, and another on Bills of Quantities, and another on the Duties appertaining to the Architect, the Client, and the Builder; and he was under the impression that if those books had been thoroughly digested the work of the surveyor would come to an end. But, as a matter of fact, it was always difficult to digest such technical works; the more one attempted to digest them the more it was found that they contained what one did not want, and did not contain what one did want. If he understood Mr. Hall rightly, he proposed, for example, that an architect who had made hospitals or residences a specialty of his practice should convey to the student or to the young architect beginning practice the experience and the results of that special knowledge which he had been for many years endeavouring to attain. If that were so—he might, perhaps, have misunderstood Mr. Hall—all he could say was, that if a young architect had been commissioned to build a hospital, or an hotel, or a town-hall, or a residence, he would find, if he went to a hospital, a town-hall, an hotel, or a residence, that he could obtain from that building all that he required. To ask an architect who had attained eminence in his profession after years of practice in a particular branch to place all that knowledge at the disposal of the young architect or student was, he thought, asking too much. Such an examination as Mr. Hall suggested would be to suck the brains of the specialist. The young architect who desired to attain proficiency in any particular branch had all the opportunity that the architect had who had attained that proficiency by practice, by study, and by experience, and he did not think it would be for the benefit of the profession, or of the student, or of the public that they should impart to this young architect the special knowledge which had only been attained as the result of study and experience, and of a long life in the profession to which the specialist had devoted himself.

Mr. J. NIXON HORSFIELD [*A.*] said that, speaking from the examinee's point of view, when he had got through his three examinations he did not want to have to label, docket, and pigeon-hole himself as an ecclesiastical architect, or any other kind of architect. A friend of his who had been brought up in an ordinary office told him that when he started on his own account he waited for clients, and happened to get a job pretty quickly, and that job was to build a racecourse. He did not know anything about racecourses, but he crammed up the subject and built his racecourse. The next thing he got was a church. He did not know much about churches, but he put up a church. After that he got tired of it and started building for himself, and then he made some money! He did not suggest that that was the ideal of every architect; but however his practice might begin, it grew, it could not be foretold; it could not be prescribed by a series of eight distinct Honours Examinations. The Honours were to be won in the practice of architecture, not in the examination room.

Mr. EDWIN T. HALL [*F.*] said that as he understood it the proposition was that if a man was practising in one branch, and wanted to practise in another, he should first pass through an examination at the Institute in that particular subject in which he wanted to practise, and then get an Honours certificate or diploma in that subject. That reminded him of the story of the man who wanted to employ a boy, and he told the boy his duties would be to clean the boots, to clean the knives, to carry up the coals, to do the gardening, attend to the pony, wash the carriage, and various other things. And the boy asked: "Have you any brick-earth on your premises, sir?" The man said: "No; why?" "Because," replied the boy, "I think in my spare time I might make bricks." It seemed to him that an architect was too fully occupied to go through a series of examinations in order to enable him to specialise in a particular

branch of architecture. His own experience was that the examinations were quite enough as they were at present, and that an Associate ought to be rejoiced when he had got through them and could devote the rest of his time to qualifying himself by study and practice to take up any branch of his profession.

Mr. MAURICE B. ADAMS [*F.*] said he thought that the impression should not be quite left in the way Mr. Woodward seemed to leave it. A student had the utmost facility afforded to him by various specialists in the Institute. Take the Architectural Association, for instance; the students from Tufton Street were able to go over many buildings which were very special in character, and he was convinced that every architect would be only too willing to afford those opportunities to *bona-fide* students. He did not think it should go out to the world that there was any disinclination on the part of Fellows of the Institute to help students to obtain any knowledge that they might wish to acquire.

THE PRESIDENT: I do not think that was Mr. Woodward's idea.

Mr. ADAMS said he was sure it was not; but the impression upon his mind was that such a construction might be conveyed by reading what was said. He thought that, particularly after a certain discussion they had had recently, it ought to be on every occasion made clear that the senior members of the Institute were only too willing to afford every facility they could to students.

Mr. WM. WOODWARD: I am very glad Mr. Adams has mentioned this, because next Saturday I hope to have the opportunity of taking members of the Architectural Association over the Piccadilly Hotel.

THE PRESIDENT: And you will teach them as much as you can?

Mr. WOODWARD: That is my intention.

THE PRESIDENT having called for a seconder, and no one responding, Mr. Hall's motion fell through.

The Annual Exhibition of Prize Drawings.

The exhibition of designs and drawings submitted in competition for the Prizes and Studentships in the gift of the Institute will open at the Gallery of the Alpine Club on Tuesday, the 21st inst. The entries this year are exceptionally numerous, and the number of strainers sent in far in excess of any previous occasion. Last year the entries numbered 60, with 269 strainers. This year there are 94 entries, with 444 strainers. To display effectively this large collection of drawings has been a matter of considerable difficulty. Every inch of hanging space in the main gallery has been utilised, the staircase leading to it has been brought into requisition, and a room on an upper floor has been engaged. This upper room should not be missed by visitors, as it is devoted exclusively to the Hospital Designs sent in for the Henry Saxon Snell Prize. The present is the first competition for this valuable prize.

The Preservation of Winchester Cathedral.

Mr. Francis Fox, M.Inst.C.E., who is collaborating with Mr. T. G. Jackson, R.A., in the work now in progress at Winchester Cathedral, in a letter to *The Times*, published on the 6th inst., replies to some of the criticisms contained in the report made on behalf of the Society for the Preservation of Ancient Buildings [*Times*, 31st December], and gives some idea of the difficulties which have to be overcome in the work of making good the foundations. Mr. Fox says:—

In consequence of the grave condition of the fabric the Dean called for expert advice, and Mr. T. G. Jackson, R.A., the diocesan architect, and Mr. J. B. Colson, architectural surveyor to the Cathedral, reported upon it; but as the chief source of the difficulty was underground and, therefore, out of sight, and as it involved very serious engineering problems, it was deemed advisable that an engineer accustomed to deal with bad foundations should also be consulted, and at Mr. Jackson's request I was asked to collaborate with him.

Mr. Jackson, with much careful forethought, had caused a trial pit to be sunk near the Cathedral whilst he was engaged in timbering up the building inside and out, and succeeded in finding a fine bed of compact gravel at a depth of some 16 feet below the old foundations, from which he decided to underpin the walls; short of this depth there was no solid bottom.

The ancient builders in A.D. 1079 and again in A.D. 1202 had sunk their excavations to as low a level as their rude appliances would allow, some 10 feet below the surface. They came to a bed of marl and also to water-level, and to form a foundation they placed beech trees side by side in the trenches in a horizontal position, and on these they founded the Cathedral.

There is conclusive evidence that subsidence of the building took place at a very early date, possibly from the commencement, and wide cracks appeared in the walls. These have been from time to time hidden from view by the insertion of new stones on the face of the walls; but again cracks appeared, buttresses have moved seriously out of the upright, one gable overhanging to-day more than 4 feet, and stone has fallen from the roof-arching.

It was necessary to find out the cause; and by means of this trial pit it was discovered that the bed of marl was only 6 feet in thickness, and was resting on soft peat, similar to an Irish bog, some 8 feet in depth. This peat has compressed probably from a considerably greater thickness, and has caused distortion and cracking of the walls in all directions; and the very serious problem had to be solved as to the best method for carrying down the foundations to the gravel bed underlying the peat.

Pumping was plainly inadmissible, the use of compressed air was inapplicable, screw piles and caissons were considered and rejected, a slab of concrete on which to float the Cathedral was impossible, and finally it was decided to employ a diver, by which means the work is done quietly, noiselessly, and without vibration.

Although nothing below the ground is visible to the eye of the public, as a result of expenditure, still we are able to report that so soon as each pit or length of excavation is completed and filled up with concrete the fabric is resting on a solid foundation, good for all time. . . .

The Cathedral authorities stand in need of all the encouragement and assistance they can obtain if they are to preserve this national memorial for the use of future generations. It is the burial place of several of our Saxon kings, and is bound up in the history of our country through the whole line of Sovereigns to the present date; but it is in jeopardy, and is sinking, and in actual movement to-day in those parts in which underpinning has not been executed. Although this operation is of the utmost necessity for the preservation of the building, one-half of the excellent workmen have had to be discharged for lack of funds.

To complete this urgent work a period of at least three or four years will be required, and therefore every day lost now is to be deplored, as the repairs will not brook delay.

Those engaged in the work, and who love these ancient buildings, will not allow an old stone, with its weather-worn edges, its mossy appearance, and with all its history, to be touched, much less discarded, unless it is actually crushed and broken; the work is being done with the most profound solicitude and reverence, and all we ask for is kindly assistance and practical help.

The Excavation of Herculaneum.

The Times correspondent, telegraphing from Rome on the 1st inst., says that Signor Rava, Minister of Public Instruction, has appointed a special commission to direct and supervise the excavations at Herculaneum, composed of Commendatore Gattini, Administrative Director of the Museum of Naples, Signor de Petra, Professor of Archæology of the University of Naples, Professor Gabrici and Professor Dall'Osso, both of the Museum of Naples, Professor Sogliano, director of the excavations at Pompeii, Commendatore Avena, director of the technical office of the monuments of Naples, and finally two civil engineers of the province of Naples. The work done, the finds and discoveries, and anything interesting will be described from time to time in official publications, for the benefit of home and foreign students and scholars.

Société Centrale des Architectes Français.

Monsieur J. Guadet, the distinguished Professor at the Ecole des Beaux-Arts, Paris, and author of *Elèments et Théorie d'Architecture*, has been elected President of the Société Centrale des Architectes Français. M. Guadet was awarded the Grand Prix de Rome in 1864, and is the architect of the National Post Office, Paris.

The late Edward George Hayes.

Mr. E. G. Hayes, who died on the 21st ult., at the age of sixty-four, was elected an Associate of the Institute in 1876, and resigned his membership on retiring from business a year ago. Mr. S. Cecil Searle [*A.*], in a letter to the Institute announcing the sad news, says: "Mr. Hayes joined my late father and myself in partnership in the year 1876, and our business connection was only terminated by his retirement last year after over thirty years of partnership. He will be remembered as having served the Architectural Association in several offices, including that of President. A hard worker, a firm friend, and a man of a perfect integrity in his personal relationships, Mr. Hayes was of a peculiarly retiring and unassuming disposition, and never sought recognition." The Hon. Secretary, Mr. Alexander Graham, F.S.A., in formally announcing the decease at the General Meeting last Monday, said that many would recall the years 1880 to 1883 when Mr. Hayes was President of the Architectural Association, succeeding Sir Aston Webb in that office of distinction, and being followed by Mr. Cole Adams. The distinction achieved by Mr. Hayes in those days was well known to them, and they would all lament his death as a great loss to the Institute and to the Association.

REVIEWS.

THE ARCHITECTURE OF GREECE AND ROME.

The Architecture of Greece and Rome: a Sketch of its Historic Development, for the use of students and others. By William J. Anderson, A.R.I.B.A., Author of "The Architecture of the Renaissance in Italy," and R. Phenè Spiers, F.S.A., F.R.I.B.A., Correspondant de l'Institut de France, Hon. Member of the American Institute of Architects, and Author of "Architecture, East and West," &c. Second edition, revised and much enlarged. 8vo. London, 1907. Price 18s. net. [B. T. Batsford, 94 High Holborn.]

The work planned and begun by the late regretted W. J. Anderson and completed by Mr. Phenè Spiers was the first English monograph of modern times which attempted to group together comprehensively the scattered material relating to classical architecture and at the same time to place it in the historical setting without which it cannot be intelligible. Relegating to the background those arid technicalities with which we were all too familiar in our youth—those terrible "amphidistyle-in-antis," "hexastyle pseudo-dipteral," and so forth—they presented the architectural development in its true relation to history and the state of contemporary civilisation, thus making the dry bones to live and to yield matter of real educational value.

It is a hopeful omen for architectural studies that within five years a new edition should be called for, testifying as it does to the widely felt need for such a work. It is also a happy thing

that Mr. Spiers should have this opportunity of bringing his book up to date. In an age when every year bears its sheaf of discoveries fraught with explanations of old difficulties and with new problems to be solved, frequent revision of conclusions is a necessity.

The work of Schliemann in Argolis and the Troad a generation ago, that of Dr. Evans and the Italian school in Crete in the last ten years, each revealed the existence of a hitherto unsuspected civilisation and revolutionised our ideas on the origins of classic art, while the systematic exploration of Rome has cleared away many obscurities and misconceptions. In another five years we may look for still further evidence on prehistoric Greek culture, leading perhaps to further modifications of present conclusions, while such excavations as those now undertaken by the French Government at Cyrene and by the Italian Government at Herculaneum may be expected to give us fresh insight into later Greek and Roman antiquities.

As in the previous edition, the results of recent exploration—*e.g.* in the Roman forums, the Palatine, the Pantheon, or the subject of interaction of Oriental and Roman art in the Imperial Age—could be treated in a manner impossible to earlier writers, so in the second Mr. Spiers is able to incorporate an account of the Cretan finds, and to make good use of the light which they cast on primitive Greek architecture. The possibly non-Hellenic Cretan empire, which according to Prof. Burroughs passed through nine distinct stages of culture, all traceable in the strata of *débris* at Cnossos, and terminated almost before the dawn of even the legendary history of Greece, is now seen to have exercised an influence formerly ascribed to Egypt and Persia on the art of the Greek mainland and islands. The well-known remains at Mycenæ proving to be a local manifestation of a widespread culture, the term "Ægean" is now substituted for "Mycenæan" as a designation for prehistoric Greek art.

While the earlier chapters thus naturally contain the greatest amount of new matter, most of the subsequent ones have also gained in fulness by the inclusion of descriptions of buildings only slightly referred to before. Very interesting is the information given about Roman construction, and in view of the self-righteous strictures on classic architecture on the part of Gothic enthusiasts, to which we have been too long accustomed, particularly instructive are those passages in which Mr. Spiers brings out Roman anticipations of mediæval vaults and the structural character of much in Roman buildings which has often been stigmatised as unnecessary applied decoration.

On the other hand, the description of the construction of the dome of the Pantheon might be improved. As it stands and without a diagram it is really not intelligible. Is it one homogeneous mass without thrusts; and does it contain the pottery jars which figure in some descriptions? These points require at least a passing reference. Some notice too of the Septizonium of Severus, the colonnaded streets of Timgad, and the Porte de Mars at Besançon would be welcome.

The present generation of architects has welcomed into its ranks members of the gentler sex, but it appears that it cannot plume itself on this fact as a novelty; for on p. 113 we learn that in 334 B.C. there was a talented lady at Miletus who collaborated in the design of the temple of Branchidæ.* This is, of course, a slip, and should with the following minor points be corrected in another edition. On p. 270 Marcus Aurelius is identified with Antoninus Pius, though on p. 274 he is correctly stated to have been the latter's adopted son. On p. 104 a remark about a point of design in Defrasse's work is valueless without illustration or description. On p. 109 (note) "portion" appears to stand for "variety." No explanation of No. 12 in the plan of a Pompeian house (p. 305) is given. Some remark is needed in reference to the large arched openings shown in the illustration of the Stoa at Alinda (p. 138). Such features are, to say the least of it, unusual in Greek work.†

Speaking generally, a slight tendency to repetition might be repressed in a further edition, *e.g.* Middleton's remark about pozzolana is given both on p. 163 and p. 168; the observation that the Romans availed themselves of hilly sites for theatres is given twice, once qualified by "occasionally" (p. 231), once by "always" (p. 294). The last sentence on p. 316 practically repeats a remark on p. 313.

The illustrations have been increased from 199 to 255, and the number of new ones is greater than the difference between these figures, for several whose interest was not strictly architectural and others which subsequent research has put out of court have wisely been eliminated. We are now given plans and other illustrations of many buildings illustrated less fully or not at all in the first edition, *e.g.* in the Greek section the Palaces of Cnossos and Palatitza, the Sanctuary and Hall

* Daphne is a feminine form. The architect's name was really Daphnis.

† On p. 291 "seventeenth century" should be "eighteenth." Antæ capital should read either "anta cap^{l}" or "antæ cap^{ls}," p. 61. On pp. 97 and 255 "exedra" is printed instead of the plural "exedræ," *cf.* "stele" for "stelæ" (p. 117), and "fascia" for "fasciæ" or "fascias" (p. 82). "Capitol" should read "capital" (p. 193), "joists" should read "rafters" (p. 303), "or Branchidæ" should read "at Branchidæ" (p. 113).

The following wrong references to illustrations are given: "Ill. 49" for "ill. 48" (p. 95), "ill. 117" for "ill. 119" (p. 138), "ill 157, p. 190," for "ill. 157 between pp. 188 and 189" (pp. 159 and 227), "ill. 45, p. 57," for "ill. 45, p. 56" (p. 183). There appears to be no plate corresponding in number and description with "Plate V" quoted on p. 95. The illustration on p. 134 has no number; it should be 117.

of the Mysteries at Eleusis, the city of Olympia, the Thersilion at Megalopolis, and in the Roman section the Basilica of Constantine, the Theatre of Marcellus (we still miss the arch of Septimius Severus), and in both a long list of temples. Among the illustrations now substituted for rejected ones Mr. Spiers's conjectural restoration of the entrance to the so-called tomb of Agamemnon is specially interesting (p. 20). Further, a number of new examples of detail are also figured.

Another excellent feature of this edition is the inclusion of maps of Italy and Greece; their value would, however, be enhanced by revision. Unimportant names (*e.g.* Samothrace, Thera, Cotrone), which are not mentioned in the text, might well be omitted; while, on the other hand, we miss others which do occur (*e.g.* Alinda, Attica, Bassæ, Branchidæ, Corneto, Delos, Norchia, Palatitza). Again in the Italian map Volci in Etruria is not to be found, but in its stead we have Vulci in Lucania, a totally different place and devoid of architectural interest. It is perhaps impossible to be entirely consistent in the selection of the form of names, but in these maps the variety is unnecessarily bewildering. If we are to have the Italian Assisi, Cervetri, Palermo, Pozzuoli, Rimini, Spalato, Taormina, instead of their Latin equivalents, why not also Chiusi, Girgenti, Palestrina, Pesto, Taranto? The Greek names of Greek cities should also be inserted side by side with the Latin or modern ones (*e.g.* Acragas, Posidonia), especially when Selinus is given and not Selinuntium. Again, names printed in large type are capriciously selected; the obscure Ætolian Thermos looks more important than Athens and much more so than Sparta, while Troy and Rhodes are eclipsed by Messa and Aizani.

A full register of Greek temples is now provided, and there seems no reason why a similar Roman list should not be added. It is regretable that here, and indeed throughout the book, Greek gods should not have their own Greek names instead of those belonging to the far more prosaic divinities with which the Romans identified them, often on very inadequate grounds. Such appellations as Ceres of Eleusis, Minerva Polias, Juno of Samos, Jupiter Olympius, Neptune of Pæstum (where the very name of the city is derived from Poseidon), are anathema to all lovers of Hellas. Mr. Spiers's standard of nomenclature (p. ix) is, after all, only a counsel of despair; and if people do not know that Diana of the Ephesians is Artemis, it is high time they did.

The glossary, which is half as large again as in the first edition, is proportionately increased in utility. Among the corrections introduced are those of the misspelling "Aecus" and "Bouleterion," and a justification of the term "Epinaos." Such terms as astragal, cavetto, opus incertum, opus reticulatum, opus sectile, peribolos, polos, torus, which occur in the text, might well be defined here; it would also be useful for non-classical scholars to have the accent and quantity in doubtful cases marked for them, *e.g.* Póstĭcum, Xóănon, Opisthódŏmus, Pinacothēca, Cárcĕres.

Surely the definition given to "Apteros" applies only to the word "Apteral." In any case the paragraph as it stands is misleading, and likely to cause the unwary student to imagine that the adjective in "Nike Apteros" applies to the temple and not to the goddess, a reading incompatible with Pausanias, I. xx. 4: "*τῶν δὲ προπυλαίων ἐν δεξιᾷ Νίκης ἐστὶν Ἀπτέρου ναός.*" It would be well to indicate (in a note to p. 71) that the more accurate designation is "the temple of Athene Nike." Nike was always winged, but here she was identified with Athene, who never had wings (*cf.* Frazer, *Paus.* II. 257). Pausanias himself (III. xv. 5) accounts for the absence of wings by saying "the Athenians had a notion . . . that she [*i.e.* Victory] will always stay where she is because she has no wings."

The definitions of "gymnasium" and "palæstra" adopted in the first edition are maintained, though so dogmatic a pronouncement on the subject of an unsettled controversy of at least sixty years' standing is scarcely justified. The view that the gymnasia were *private* schools giving regular instruction in physical energies to boys, and the palæstræ *public* establishments where youths and adults already trained resorted for practice and exercise, but where no regular training for the games or for professional athletes was given, seems indeed to be more generally held by scholars (*cf.* Smith's *Dictionary of Classical Antiquities*, 1891, "Palæstra"); but it only applies to the best period of Greek civilisation, and perhaps chiefly to Athens (*cf.* Grasberger, *Erziehung und Unterricht im klassischen Alterthum*, ii. 254). On the other hand, the view that the gymnasium was the general name for places of physical culture, which were used especially for races and the pentathlon, and that they usually, but not invariably, comprised a palæstra devoted to boxing, the pancration, and particularly, as the name implies, to wrestling, is held by competent authorities (*cf.* Daremberg and Saglio, *Dict. des Antiquités*, 1896, "Gymnase"). Such a passage as Plautus, *Bacch.* III. iii. 22:

> Ante solem nisi tu exorientem in palæstram veneras,
> Haud mediocris gymnasii præfecto pœnas penderes,

fully tallies with this view.

The Romans, in whose life physical training for well-born boys formed no integral part, as it did with the Greeks, but was rather looked askance at, appear to have used the terms indiscriminately, or to have made a distinction, if anything, rather in the use to which gymnasia and palæstræ were put than in the age of the athletes. From Catullus in his *Attis*, l. 60,

> Abero foro, palæstra, stadio, et gymnasiis,

it is clear that both were frequented by a young man; and from ll. 63, 64,

> Ego adolescens, ego ephebus, ego puer,
> Ego gymnasii fui flos,

that boys, youths, and young men alike used the gymnasium. It follows from these various considerations that the definitions given require to be qualified.

It is pleasant in conclusion to turn from the ungrateful task of the critic to the more congenial one of congratulating both author and publisher on the appearance of this interesting work. Such minor blemishes as have been mentioned should not detract from the gratitude due to Mr. Spiers and to Messrs. Batsford for giving us this greatly improved edition of a book which has become a standard authority for English-speaking students.

WM. HENRY WARD.

MEDIÆVAL BRICKS.

THE mention of "brike" in 1437, quoted in Mr. Ralph Nevill's interesting note in the JOURNAL of 7th December (p. 114), is evidently a very early instance of the use of the *word*, for the earliest example in the "New English Dictionary" is dated 1440. But the *thing* brick was made and used in England long before the fifteenth century. Before the foreign word was introduced, bricks were called tiles (*tegulae*), as in the passage quoted by Mr. Nevill. The old name does not seem to have been superseded in the north of England until the second half of the sixteenth century. So, in the lists of York freemen, we find the names of a family of bricklayers, thus:—

36 Hen. VIII., Willelmus Leng, tyllour.

9 Eliz., Willelmus Leng, tyller, fil. Willelmi Leng, tyller.

16 Eliz., Thomas Leng, tyler, fil. Willelmi Leng, tyler.

41 Eliz., Michelus Lenge, breklayer, fil. Willelmi Leng, breklayer.*

With regard to the authorities mentioned by Mr. Nevill, who have endeavoured to persuade us that all bricks of this (fifteenth century) time were imported, their opinion appears to have been accepted by Professor Thorold Rogers, who wrote:—"Our forefathers do not seem to have made bricks till long after the period before us" (*i.e.* 1259–1400) "not perhaps from ignorance, but from indifference, for it is certain that they manufactured tiles, a much more difficult art."† This is certainly a mistake, due perhaps to the Professor not having been aware that "tiles" may have denoted either "wall-tiles," which at a later time came to be called bricks, or "thack-tiles" (roofing-tiles). Some years ago I compiled a table of prices from Hull, Beverley, and York of wall-tiles (bricks) and thack-tiles from the beginning of the fourteenth to the middle of the fifteenth century,‡ and, comparing the prices in this table with those of "tiles" in Professor Thorold Rogers's great work, it is in many cases easy to distinguish wall-tiles from thack-tiles, since the former were generally about half the price of the latter. That bricks were made in England, and not imported, is sufficiently proved by the fact that from at least as early as 1303 onward the Corporation of Hull made bricks at their own brickyard.§ Possibly some of these bricks survive in the transept of Holy Trinity Church, Hull (first quarter of fourteenth century), where they measure from about 9 inches by $4\frac{3}{8}$ inches by $2\frac{1}{16}$ inches to $9\frac{3}{4}$ inches by $4\frac{3}{4}$ inches by $2\frac{1}{8}$ inches. The bricks in the chancel of this church (second quarter of fourteenth century) measure $10\frac{1}{4}$ inches by 5 inches by $2\frac{3}{16}$ inches. The bricks used for filling in the vaultcells of the nave of Beverley Minster (second quarter of fourteenth century) measure about $10\frac{1}{2}$ inches by $5\frac{1}{4}$ inches by 2 inches, and those in the North Bar at Beverley (1409–10) are of the same size. The differences in size may therefore be a matter of locality rather than of date.

Mr. Reginald Blomfield believes that the reintroduction of brickwork was due to Flemish immigrants, because (1) there is no evidence of the use of brickwork before the reign of Edward I., and because (2) its first appearance in the eastern counties was subsequent to the settlement of Flemings in those counties, or rather almost coincident with their arrival.‖ These are very much the same arguments as those used by Professor Thorold Rogers,¶ put back a century or more in date. I am not sure that there are not, in the eastern counties, examples of brickwork which date from before the reign of Edward I., and if Flemish immigrants made the moulded bricks in the "Chapel Barn" at Coggeshall, Essex, or if they taught the Essex men to make them, they used English and not Flemish profiles. An account of the foundation of the abbey of Kirkstall, probably of early date, although only now existing in a fifteenth-century MS., tells us that all the buildings of the abbey (begun c. 1152) were covered with tiles.** The correctness of Mr. Blomfield's opinion is, in the nature of things, difficult of either proof or

* *Register of the Freemen of the City of York*, ed. by Dr. Fras. Collins (*Surtees Society*, vols. 96 and 102), i. 265; ii. 9, 16, 44.

† *History of Agriculture and Prices*, i. 254. Cf. also i. 486 and iv. 434.

‡ *The North Bar, Beverley*, in the *Transactions of the East Riding Antiquarian Society* (1896), iv. 48.

§ The accounts of this brickyard, with interesting details of the cost of its working, appear on the Pipe Rolls and on the Hull Ministers' and Chamberlains' accounts. Some of the prices are included in my table mentioned above.

‖ *A Short History of Renaissance Architecture in England*, 260–2.

¶ *Op. cit.* iv. 434.

** *Mon. Angl.* 1825 ed., v. 531.

disproof ; but it seems to me that further investigation and a comparison of the earliest examples in the two countries are necessary before this opinion can be unhesitatingly accepted. I do not see any reason why similar conditions—the absence of good building stone and the presence of suitable clay—should not have led to the revival of brick-making in the two countries independently of each other.

JOHN BILSON, F.S.A.

THE THEORY OF "REFINEMENTS."

To the Editor JOURNAL R.I.B.A.,—

SIR,—Your correspondent Mr. Deas makes me the appeal that I have virtually accepted mediæval "refinements" both by my writings and in my buildings. It must seem ungracious to protest when he puts his insinuations so courteously and with so much compliment. But if your correspondent had read further in the article from which he quotes, he would have seen that my sympathy with Mr. Goodyear went no further than that appreciation of his industry and beautiful photographs which is due to him on all hands. And indeed, if Mr. Deas had looked forward in the files of the *Architectural Review*, he would have read in Mr. Goodyear's replies that I was on no account to be regarded as a disciple—as indeed is true.

Then as to my own works of church-building, what contribution can they make to Mr. Goodyear's views? When Mr. Deas and myself draw our churches we condition their forms simply by our pencil and our paper. We can introduce "deflections," "bends," "refinements," as our tastes incline, and can get our churches built with any "asymmetry" or deformation that we may fancy. All architects' designing is in a sense *deformation*, since it twists the facts of building to the requirements of the æsthetic fancy. But my reading of ancient building forbids me accepting mediæval architecture as designed in this way. I do not believe that its forms were fanciful *deformations*, but expediencies founded directly on the structural needs. For example, to take a "refinement"—outside Mr. Goodyear's investigation—that of the pointing in the arch. In our architects' designing this is an interference with structural necessity proposed on ideal grounds. But with the mediæval builder the pointed arch was the constructive necessity of the time. So with the "bends" and "deflections" that we may simply call batters, cambers, &c.—our use of such things, since it is fanciful, can be no criterion for the mediæval use, which was practical.

Again, we architects design our churches in a couple of months, and aim to have them built in a couple of years. But were there not some centuries and a dozen purposes in the fabrics of most mediæval cathedrals? The difficulty of Mr. Goodyear's view is that it seems to propose to us a personal activity of design exercising itself on such things as "bends" and "deflections" when these have come into existence in the course of great stretches of time and by the hands of many generations of builders! One can conceive without difficulty of the handing down of the broad ideals of building—height, breadth, richness, or vista. The accentuation of some principal feature might be continued in a building of many ages. But when the "refinements" are of inches in lengths of hundreds of feet, and the consummation of a "bend" is at an interval of a generation or two after its commencement, the theory of such a scheme requires a special machinery. I feel that a secret constructional guild is hinted at—an organisation responsible from first to last for mediæval building, and handing on the sacred mystery of "refinements" from generation to generation. But such a supposition makes a "large order," and I should be glad for some one in sympathy with Mr. Goodyear's views to indicate exactly the grounds of such a theory.—I am, Sir, your obedient servant,

EDWARD S. PRIOR.

MINUTES. V.

At the Fifth General Meeting (Business and Ordinary) of the Session 1907-08, held Monday, 6th January 1908, at 8 p.m.—Present: Mr. Thomas E. Collcutt, *President*, in the Chair; 34 Fellows (including 11 members of the Council), 32 Associates (including 1 member of the Council), and a few visitors, the Minutes of the Meeting held 16th December 1907 [p. 144] were taken as read and signed as correct.

The Hon. Secretary announced the decease of Edward George Hayes, elected *Associate* 1876, retired 1907; and Frank John Brewer, *Fellow*, elected 1891.

Mr. Robert Henry Kerr, *Fellow*, attending for the first time since his election, was formally admitted by the Chairman.

The following candidates for membership were elected by show of hands under By-law 9:—

AS FELLOW.

SAMUEL HURST SEAGER [*A.* 1884], of Christchurch, N.Z.

AS ASSOCIATE.

WALTER GODFREY GREEN [*Special Examination*, 1907].

The Hon. Secretary having formally acknowledged the receipt of books presented to the Library, a cordial vote of thanks was passed to the various donors.

Mr. Chas. R. Guy Hall [*F.*] having moved, in accordance with notice, "That the Council be desired to consider the advisability of holding an Examination in Honours, and to report to a General Meeting," the motion was discussed, but failed for want of a seconder.

Mr. S. Hurst Seager [*F.*] read and illustrated by models and diagrams a Paper on SAFETY EXITS FOR THEATRES AND OTHER PLACES OF ENTERTAINMENT, and the subject having been discussed a vote of thanks was passed to him by acclamation.

The proceedings then closed, and the Meeting separated at 10 p.m.